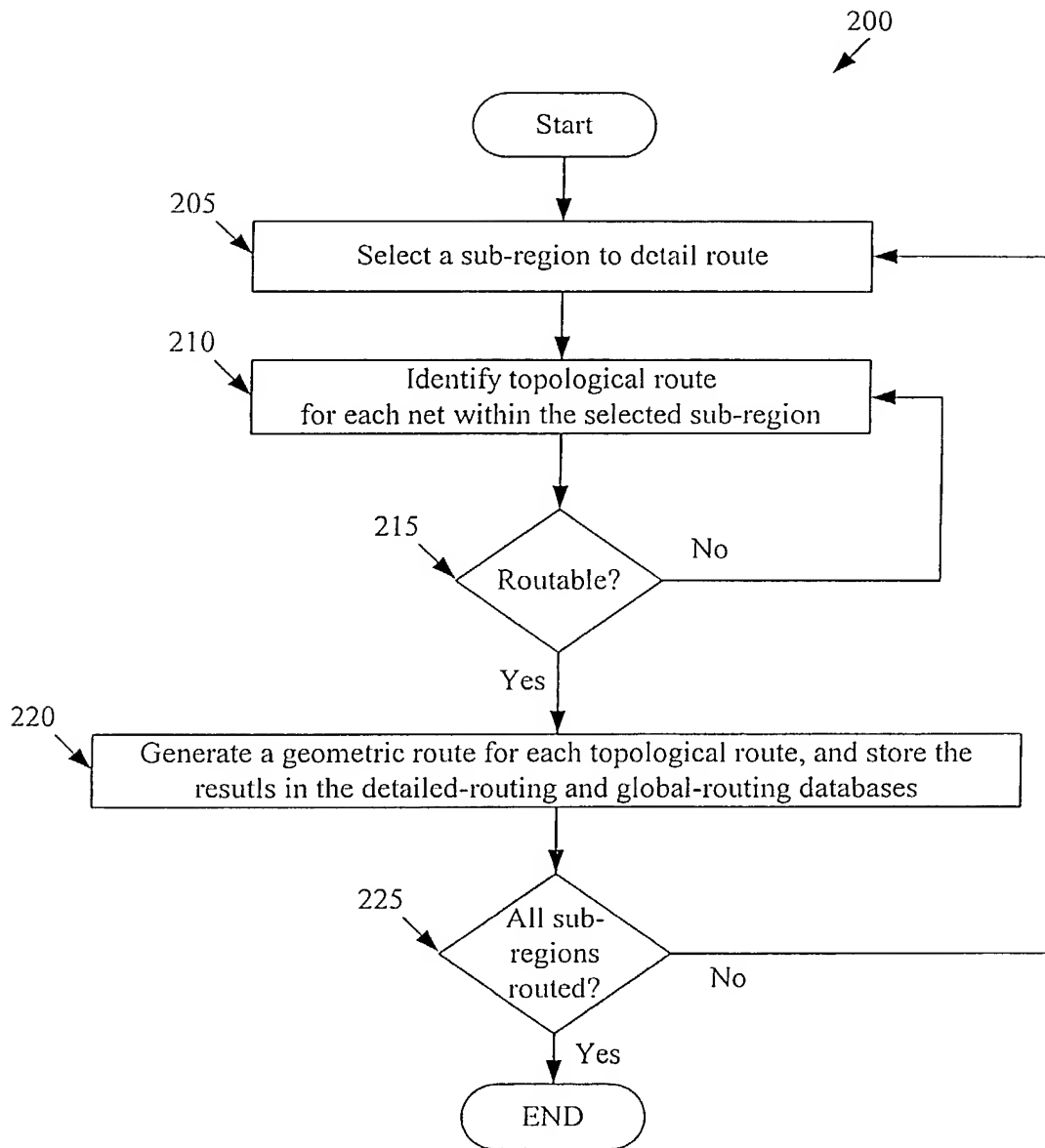


*Figure 1*



*Figure 2*

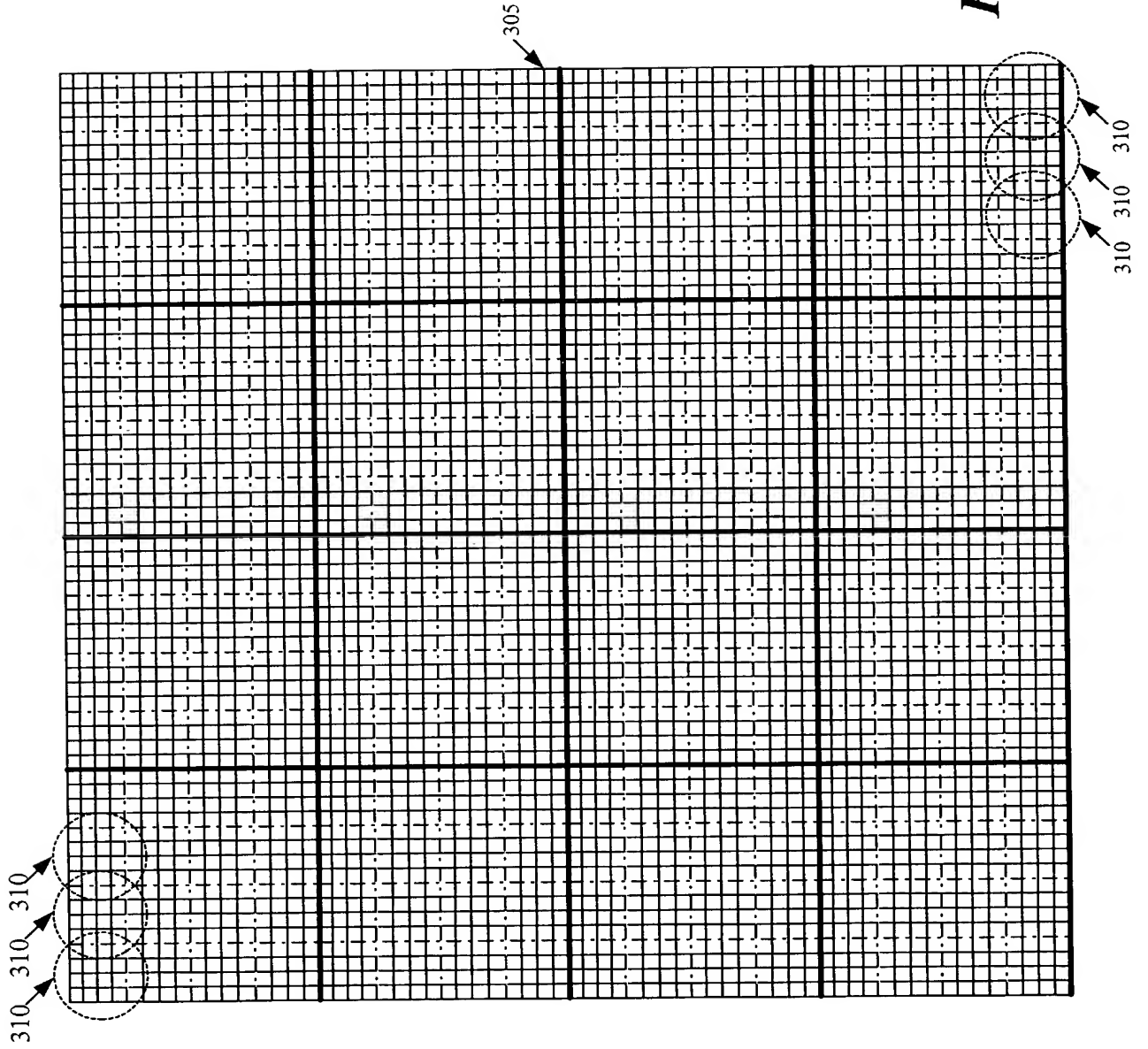


Figure 3

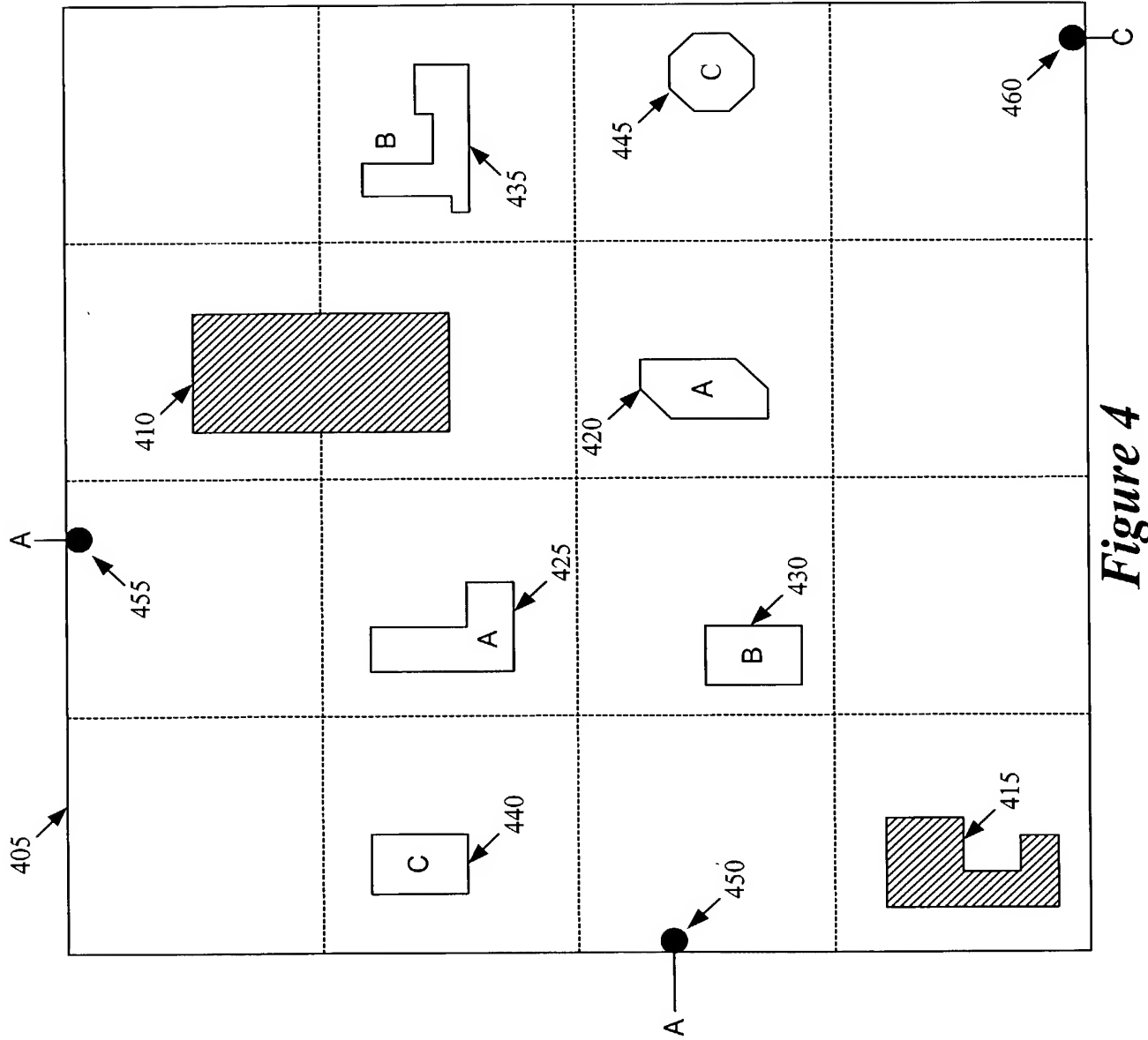
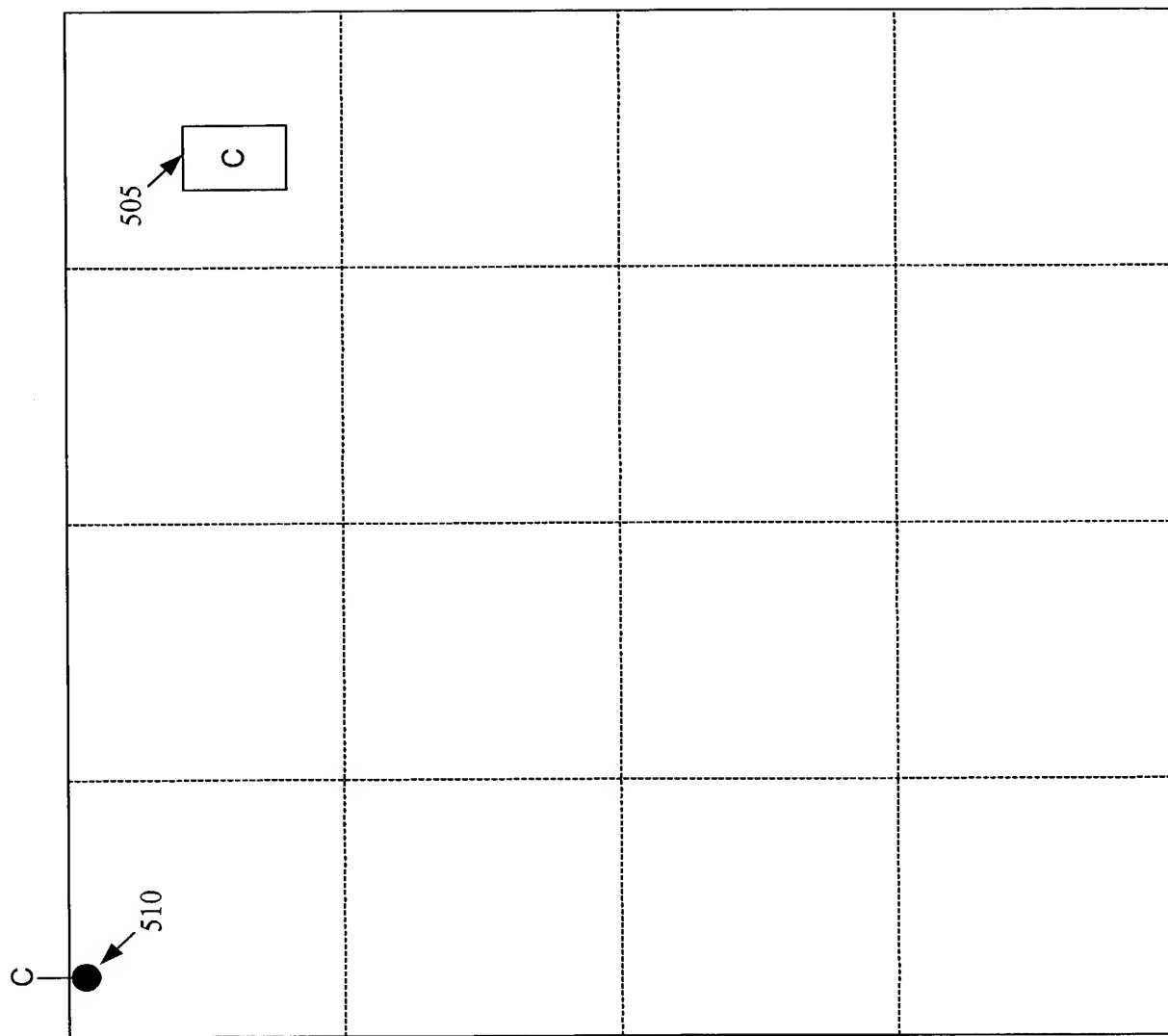


Figure 4



*Figure 5*

*Figure 6*

```
-List of Geometries
--Each Geometry including a sequence of points & layer assignment
-Bounding box of the region
-Array of layer properties
--Minimum wire size
--Minimum spacing
--Via sizes
--Cost/Unit
-Netlist specifying a number of nets
--Each net specifying a set of pins
--Each pin specifying a set of ports
--Each port specifying a set of geometries
```

*Figure 7*

```
-List of Geometries
--Each Geometry including a sequence of points & layer assignment
--List of connection nodes inside each pin geometry
-Bounding box of the region
-Array of layer properties
--Minimum wire size
--Minimum spacing
--Via sizes
--Cost/Unit
-Netlist specifying a number of nets
--Each net specifying a set of pins
--Each pin specifying a set of ports
--Each port specifying a set of geometries
-For each layer, a graph specifying
--Nodes
--Edges
--Faces
```

Face
<ul style="list-style-type: none"> <li>-Reference to 3 edges</li> <li>-Reference to 3 nodes</li> <li>-Up to two references for up to two face item</li> </ul>

800

Edge
<ul style="list-style-type: none"> <li>-Two references for up to two faces of the edge</li> <li>-Capacity</li> <li>-Flow</li> <li>-Constrained</li> <li>-Linked list of items on the edge starting with one of the edge's nodes and ending with its other node</li> </ul>

900

Figure 8

Figure 9

Node
<ul style="list-style-type: none"> <li>-Net Identifier</li> <li>-One or more planar-path references to adjacent topological items in the same planar path</li> <li>-A pair of via-path references to up and down topological via items</li> <li>-A references to list of edges connected to the node</li> <li>-For each edge, an edge reference to the next or previous topological item on the edge</li> <li>-A reference to the geometry of the node</li> <li>-Vertex number identifying the vertex of the geometry</li> <li>-Location of the node</li> </ul>

1000

Figure 10

Edge Item
<ul style="list-style-type: none"> <li>-Reference to its edge</li> <li>-Net Identifier</li> <li>-A pair of planar-path references to adjacent topological items in the same planar path</li> <li>-A pair of edge references to the next and previous topological item on the edge</li> </ul>

1100

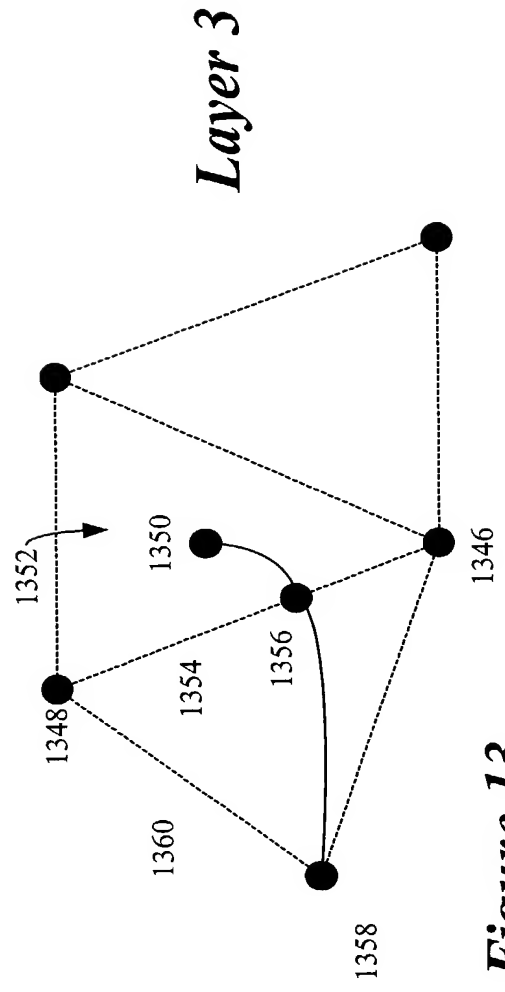
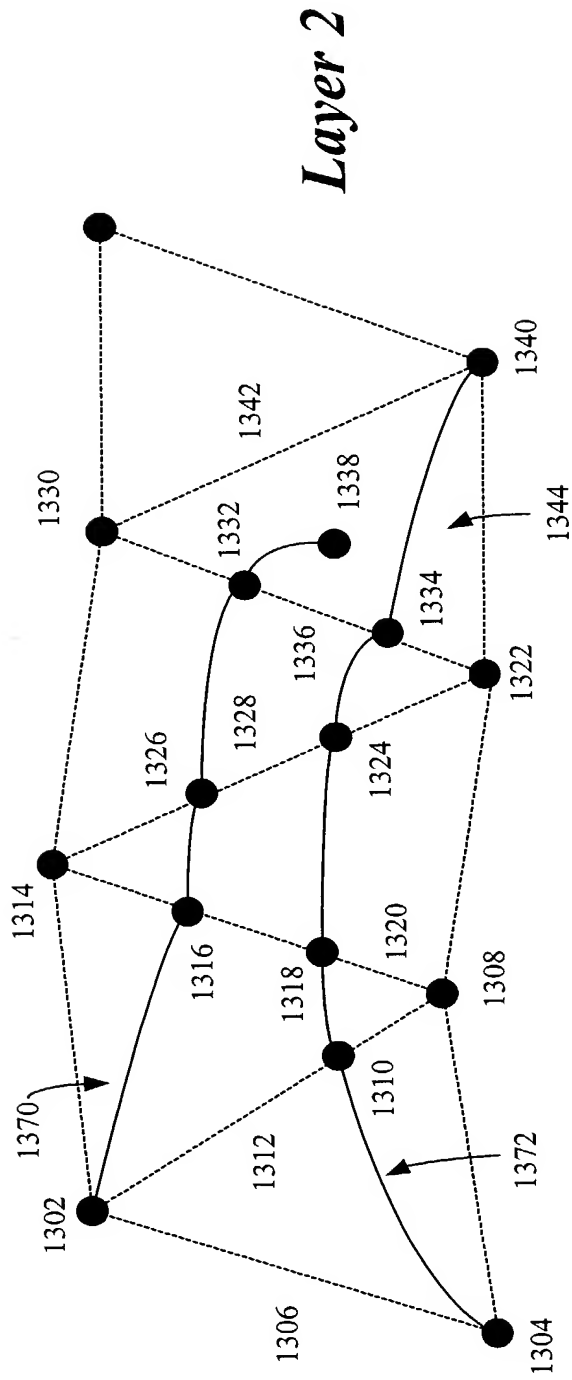
Face Item
<ul style="list-style-type: none"> <li>-Reference to its face</li> <li>-Net Identifier</li> <li>-Up to 3 planar-path references for adjacent topological items in the same planar path</li> <li>-A pair of via-path references for up and down topological via items</li> <li>-Bounding polygon that defines legal face item locations</li> <li>-Constraining Points and Distances</li> </ul>

1200

Figure 11

Figure 12





*Figure 13*



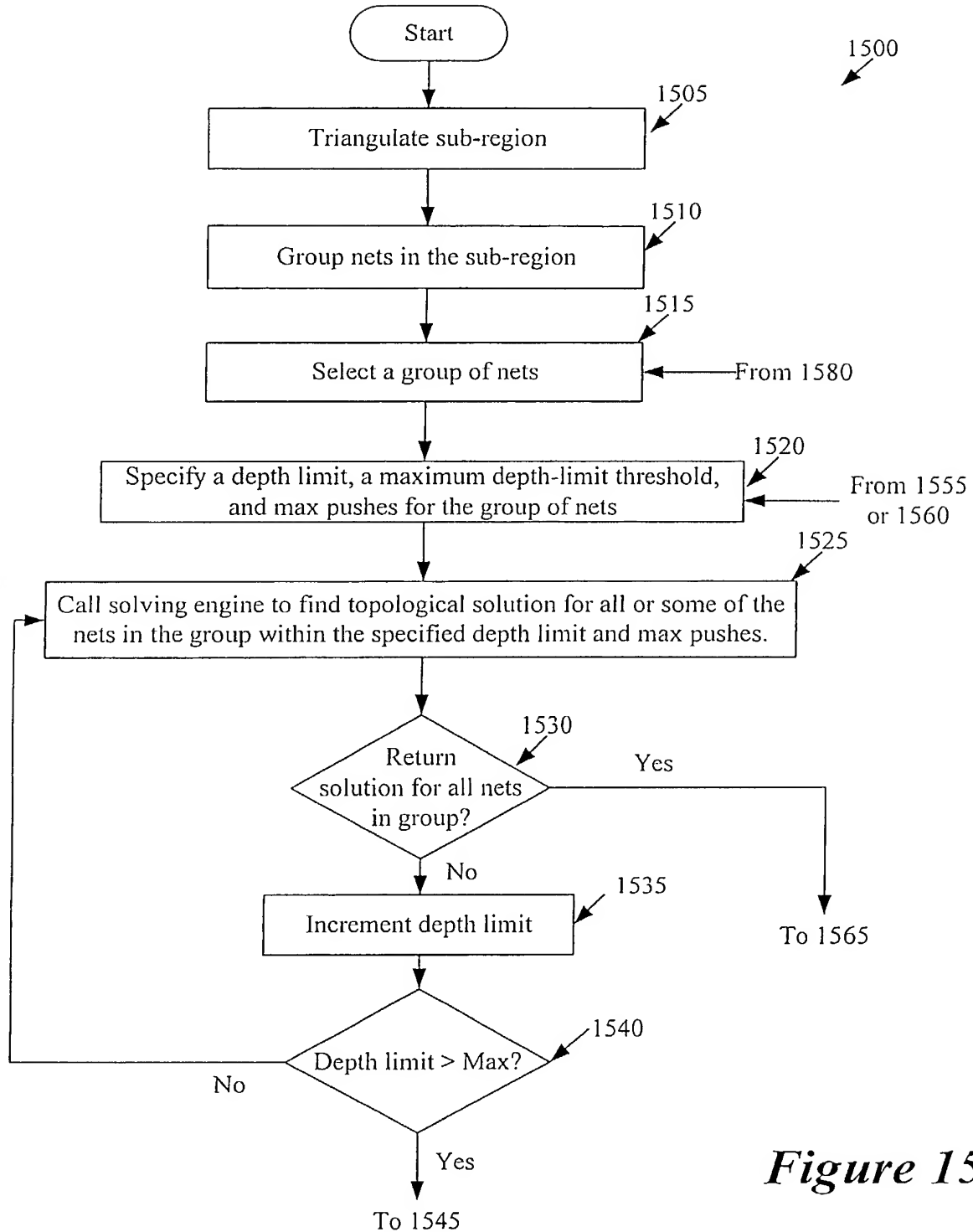
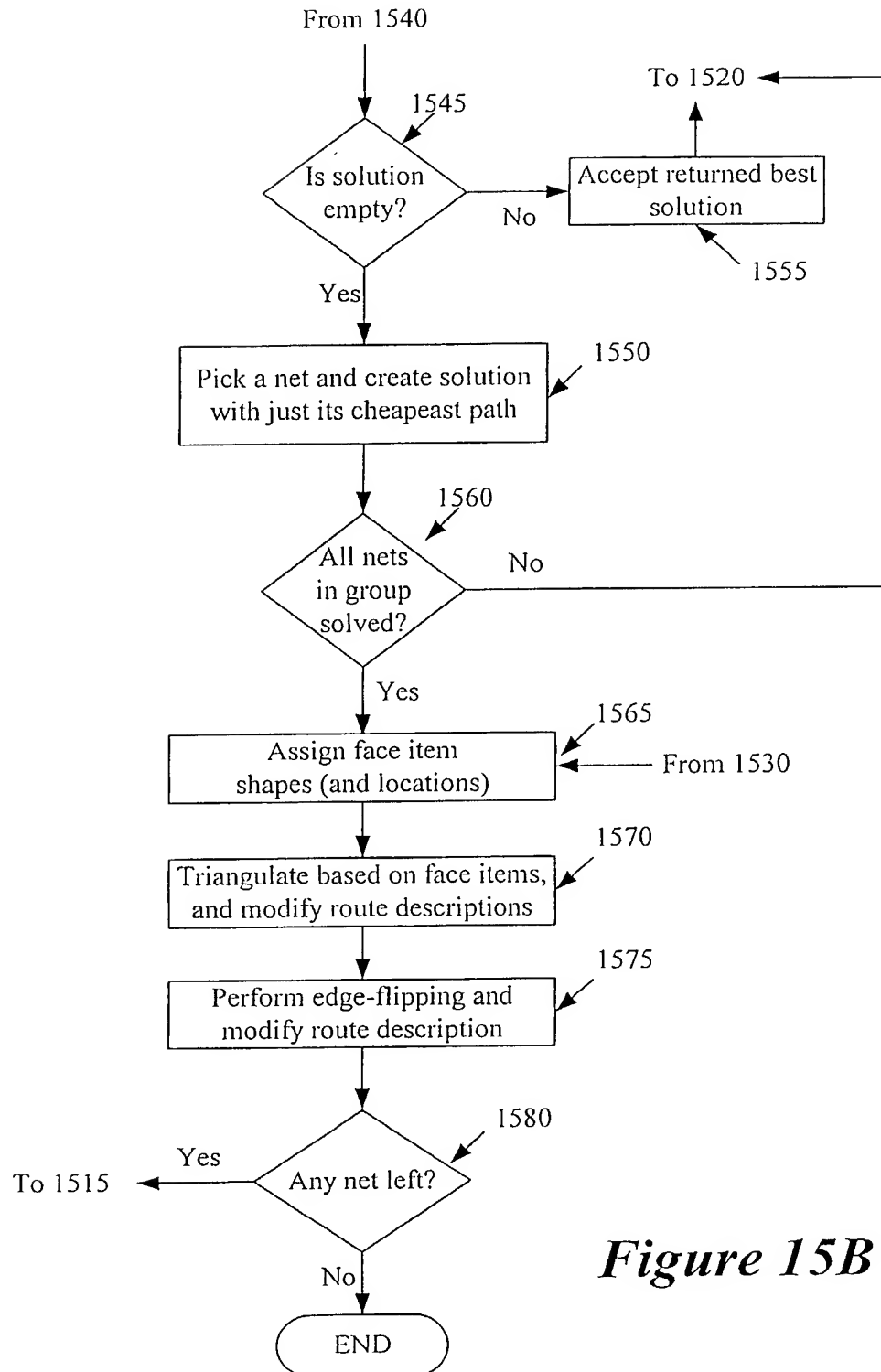
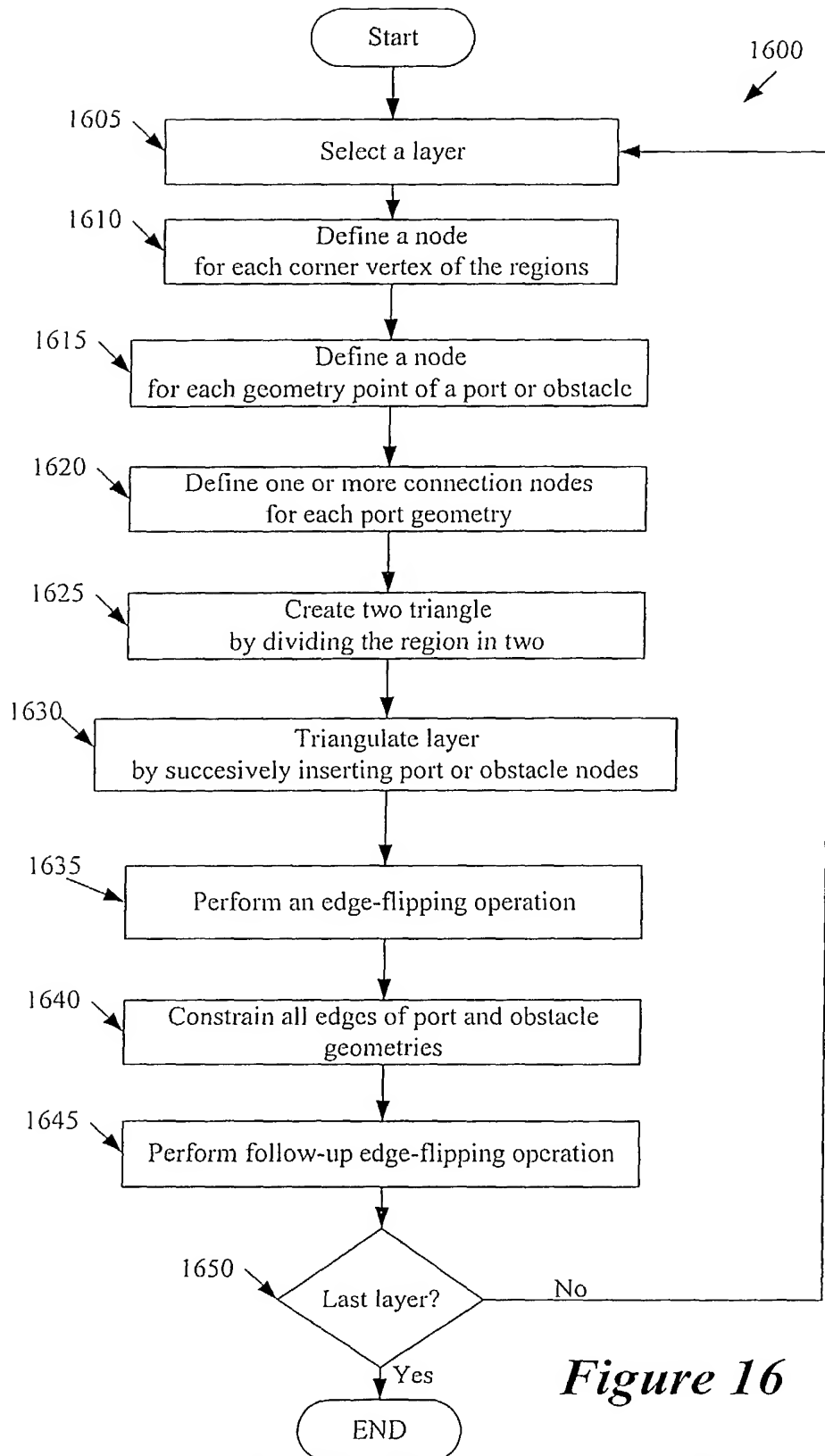


Figure 15A

Figure 15:  $\frac{\text{Figure 15A}}{\text{Figure 15B}}$

*Figure 15B*

*Figure 16*

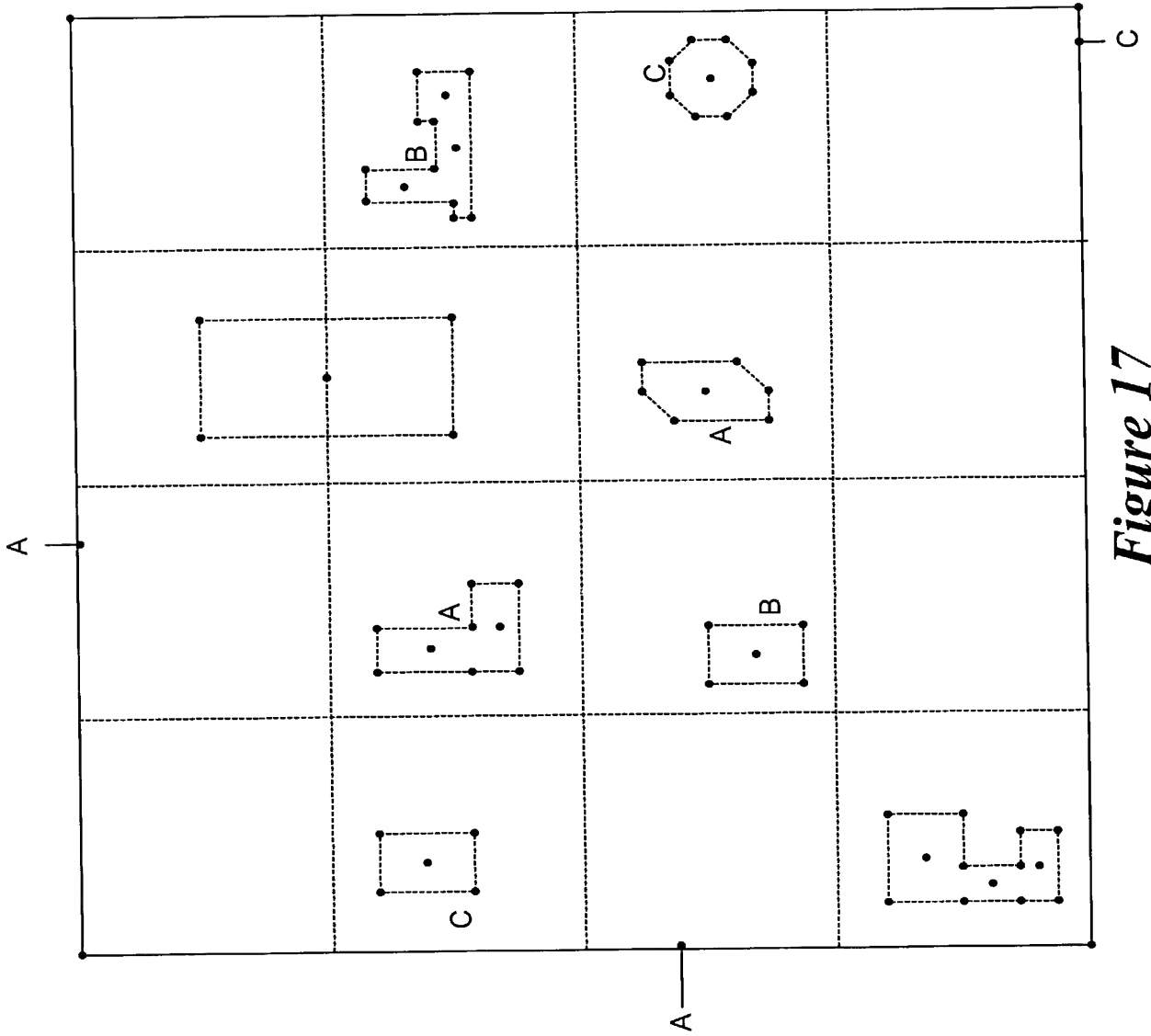
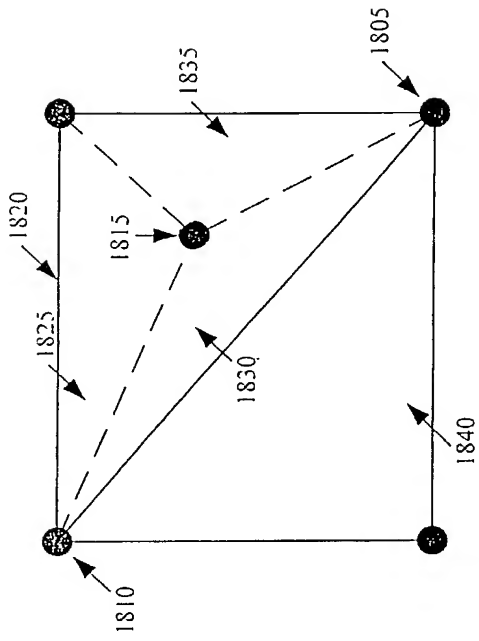


Figure 17



*Figure 18*

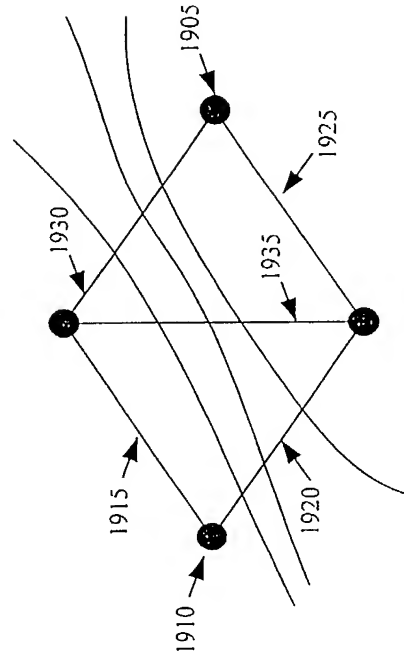
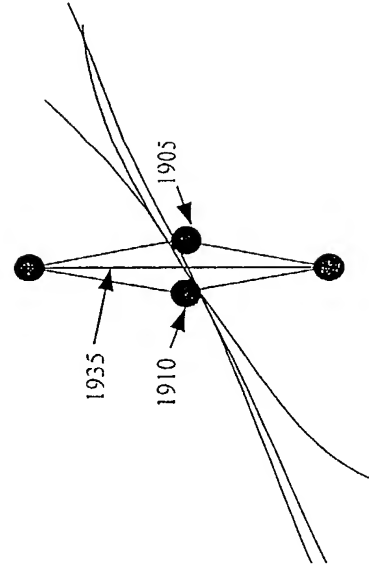
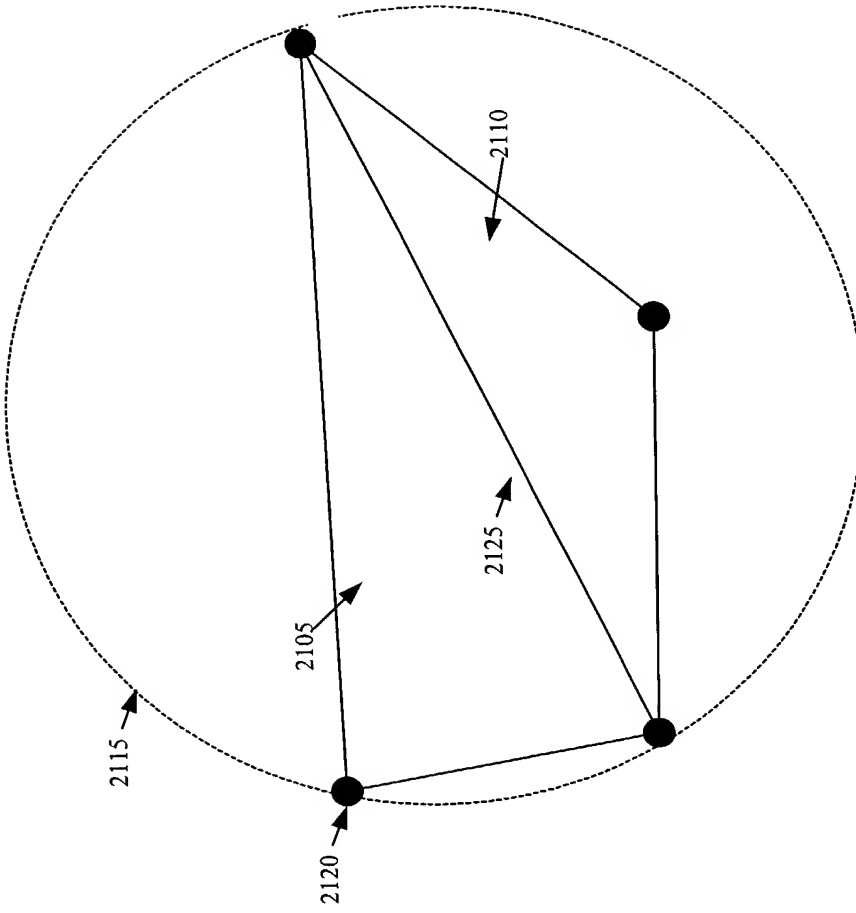


Figure 19

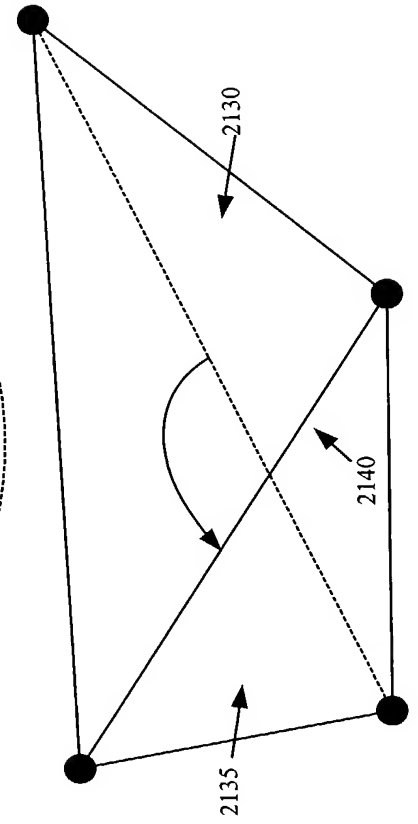


*Figure 20*

*Figure 21*



*Figure 22*





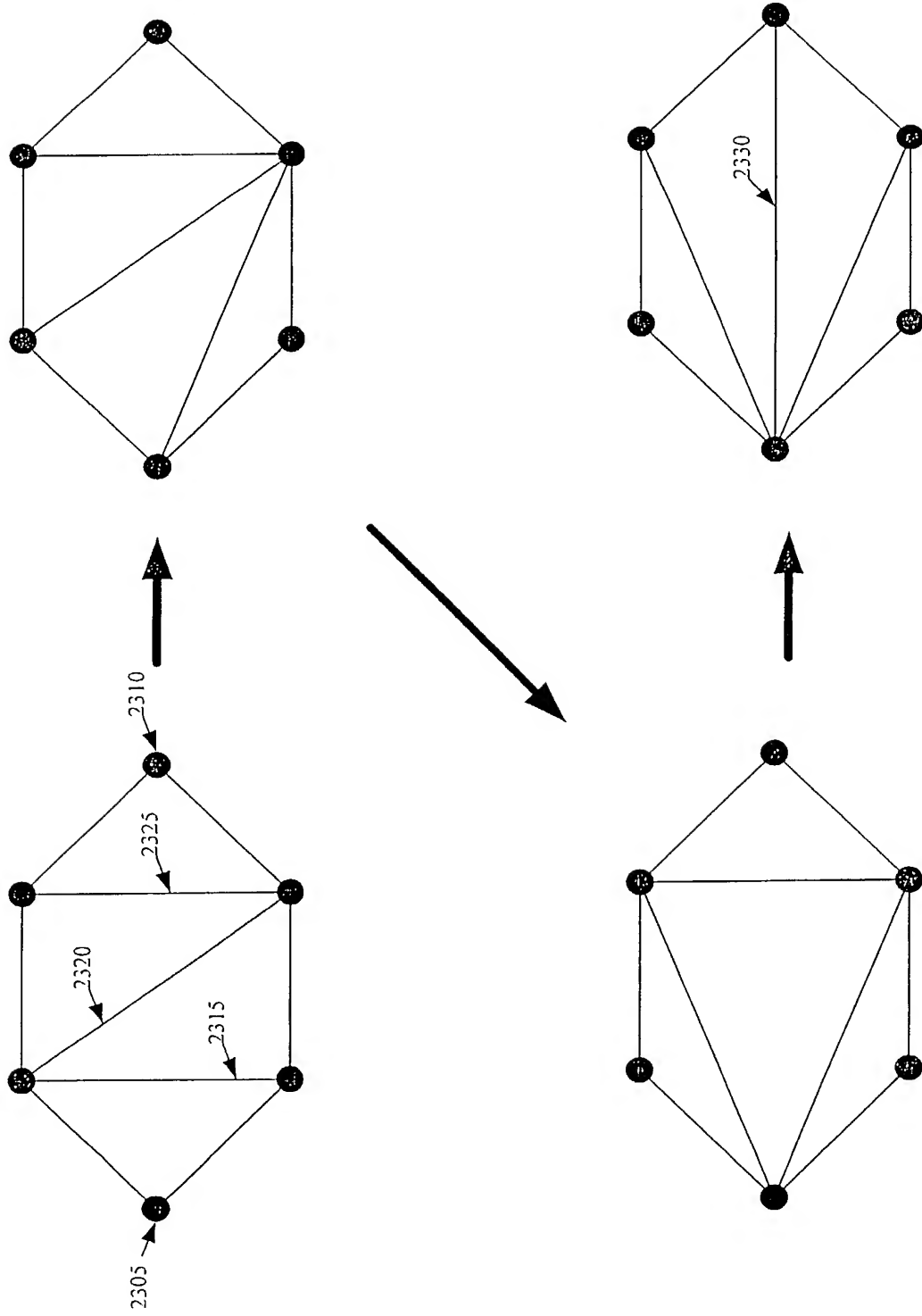


Figure 23

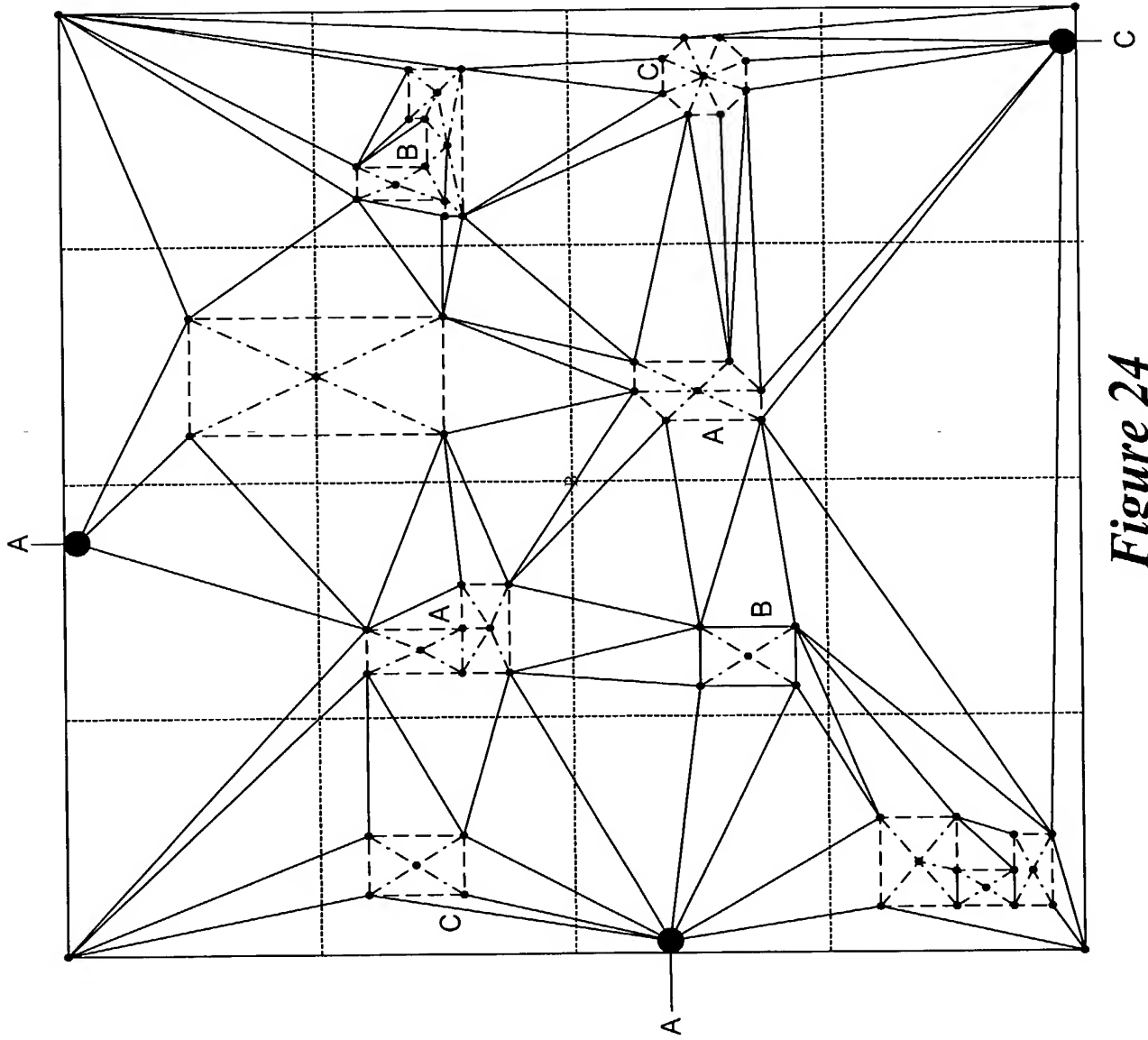
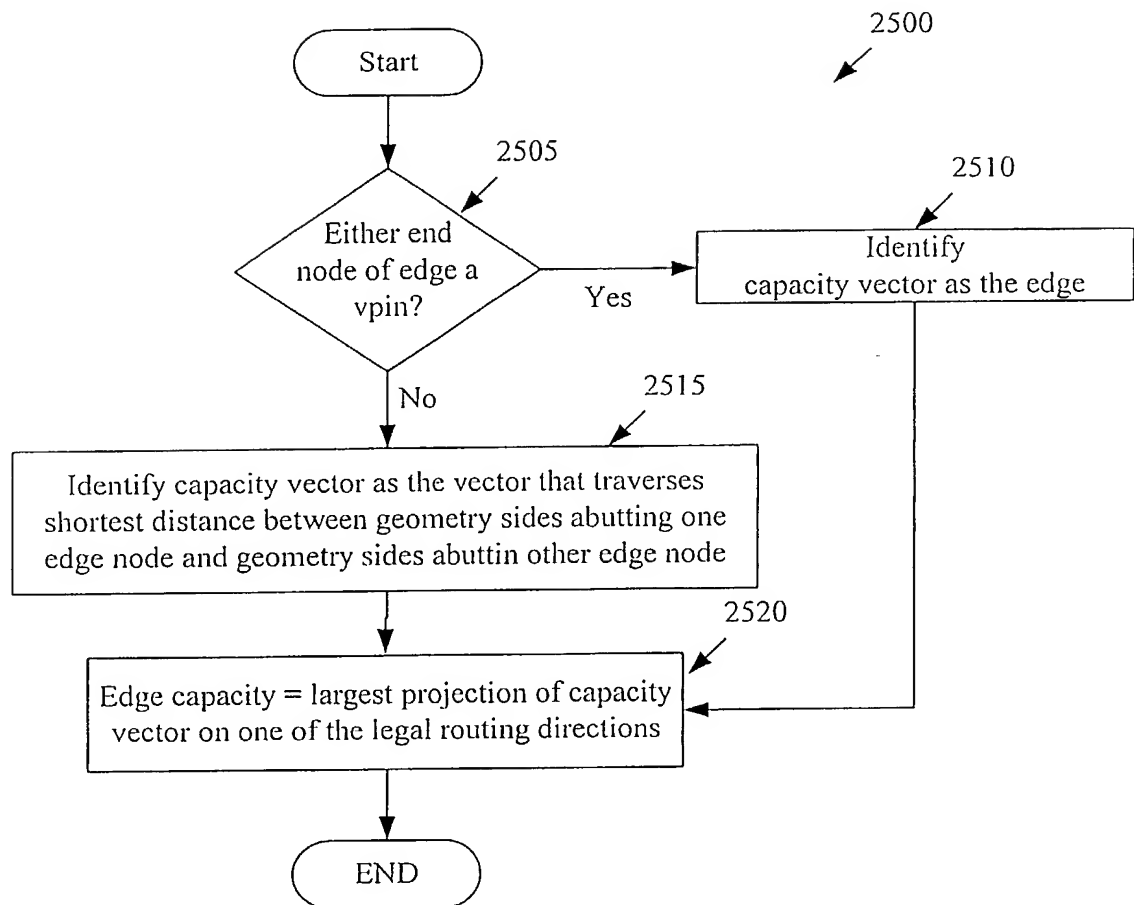


Figure 24



*Figure 25*

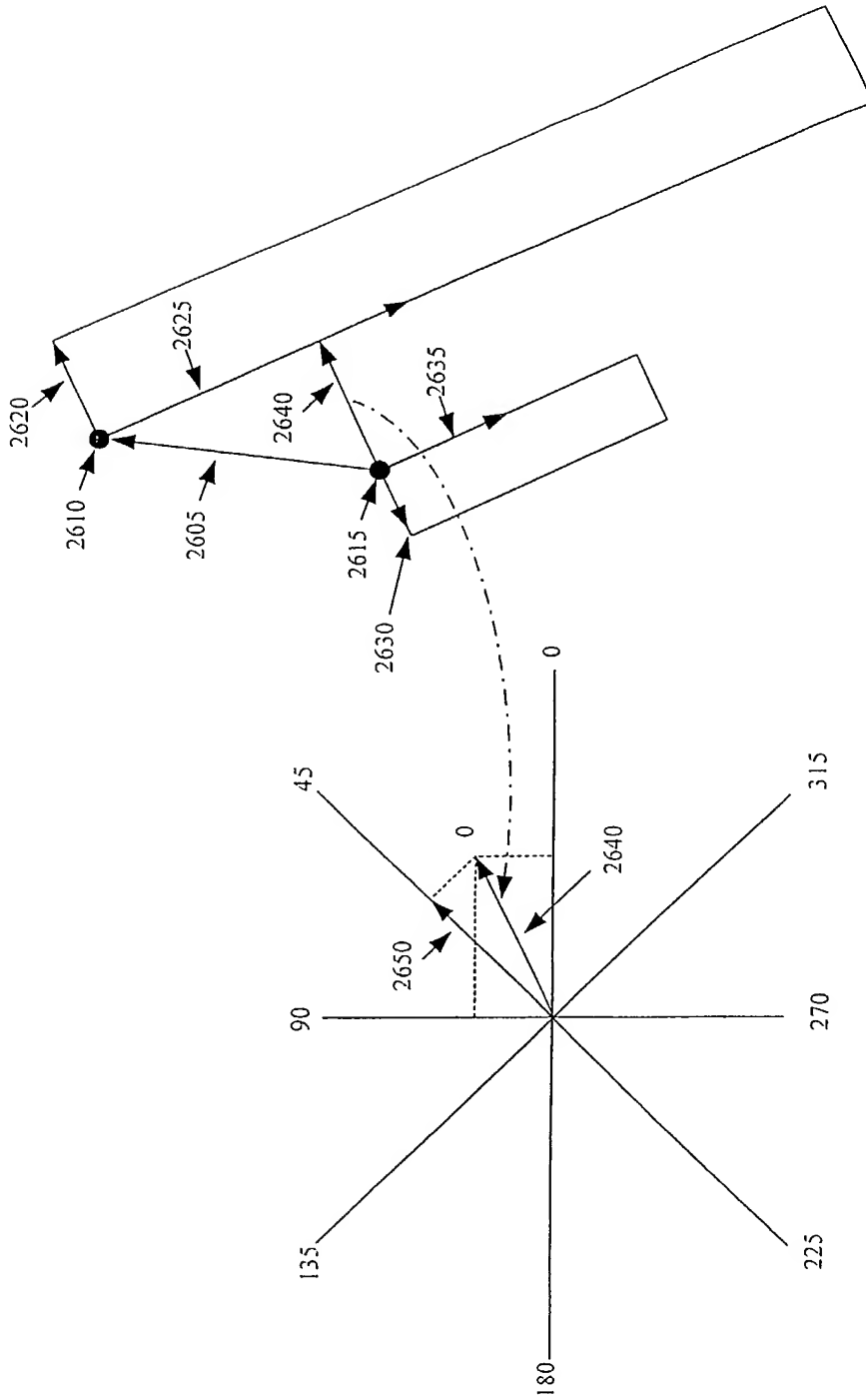


Figure 26

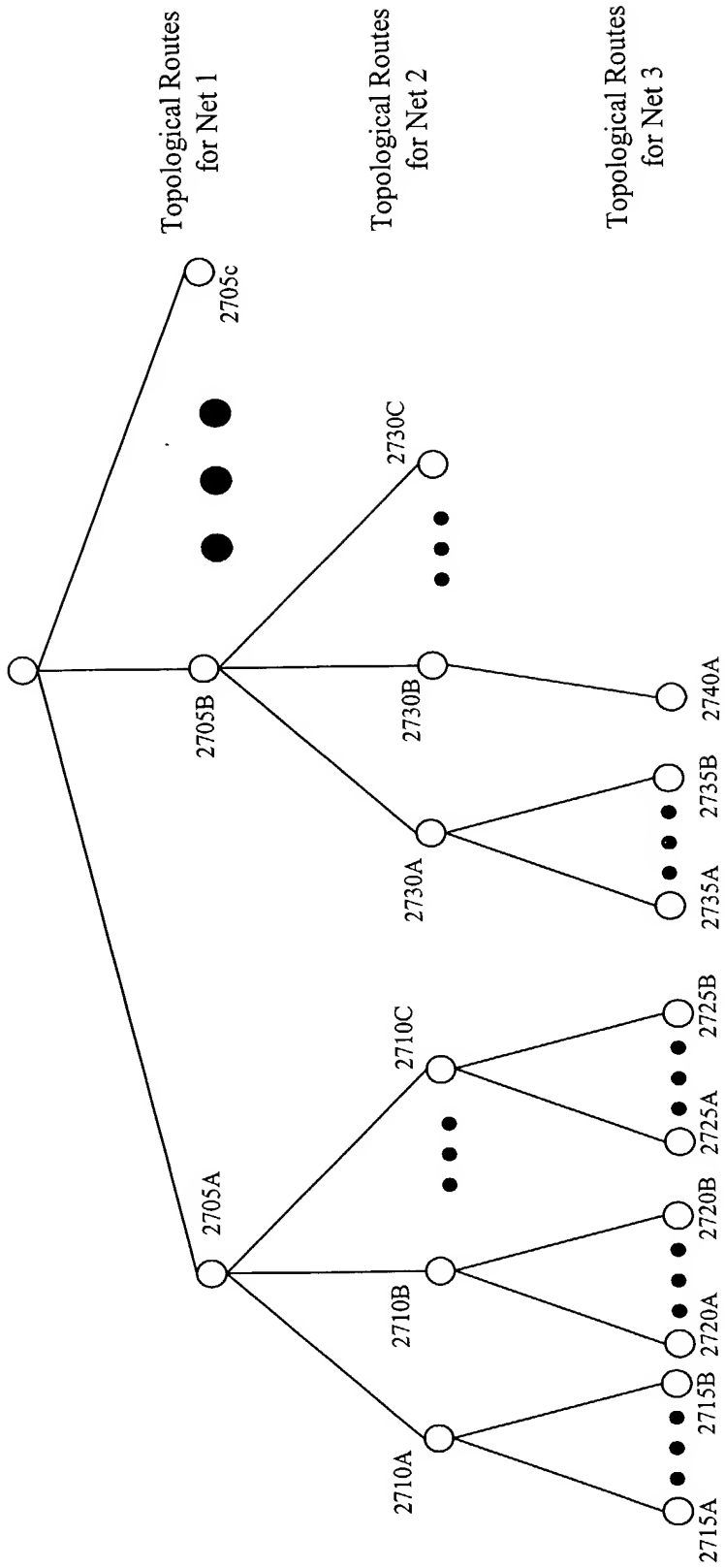
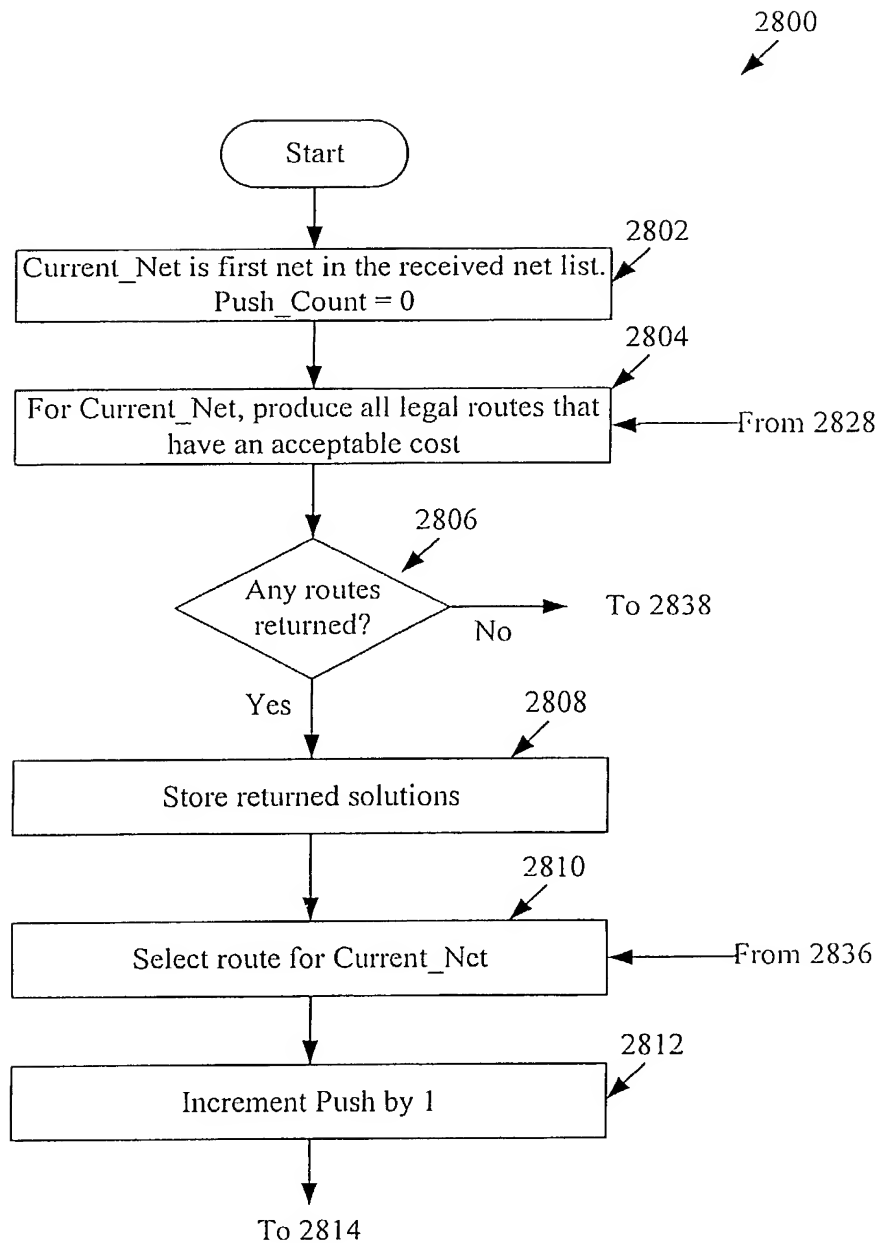
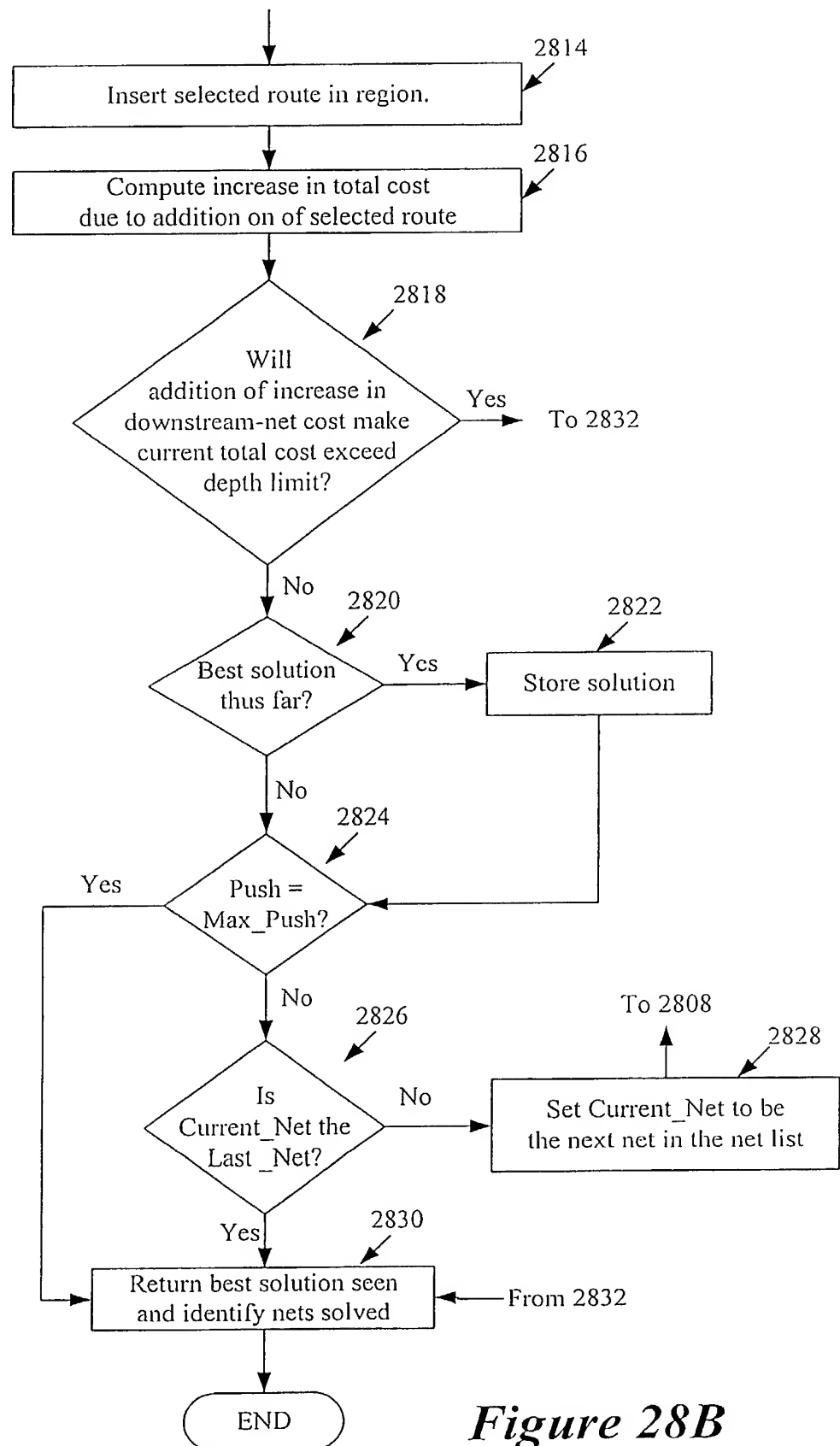


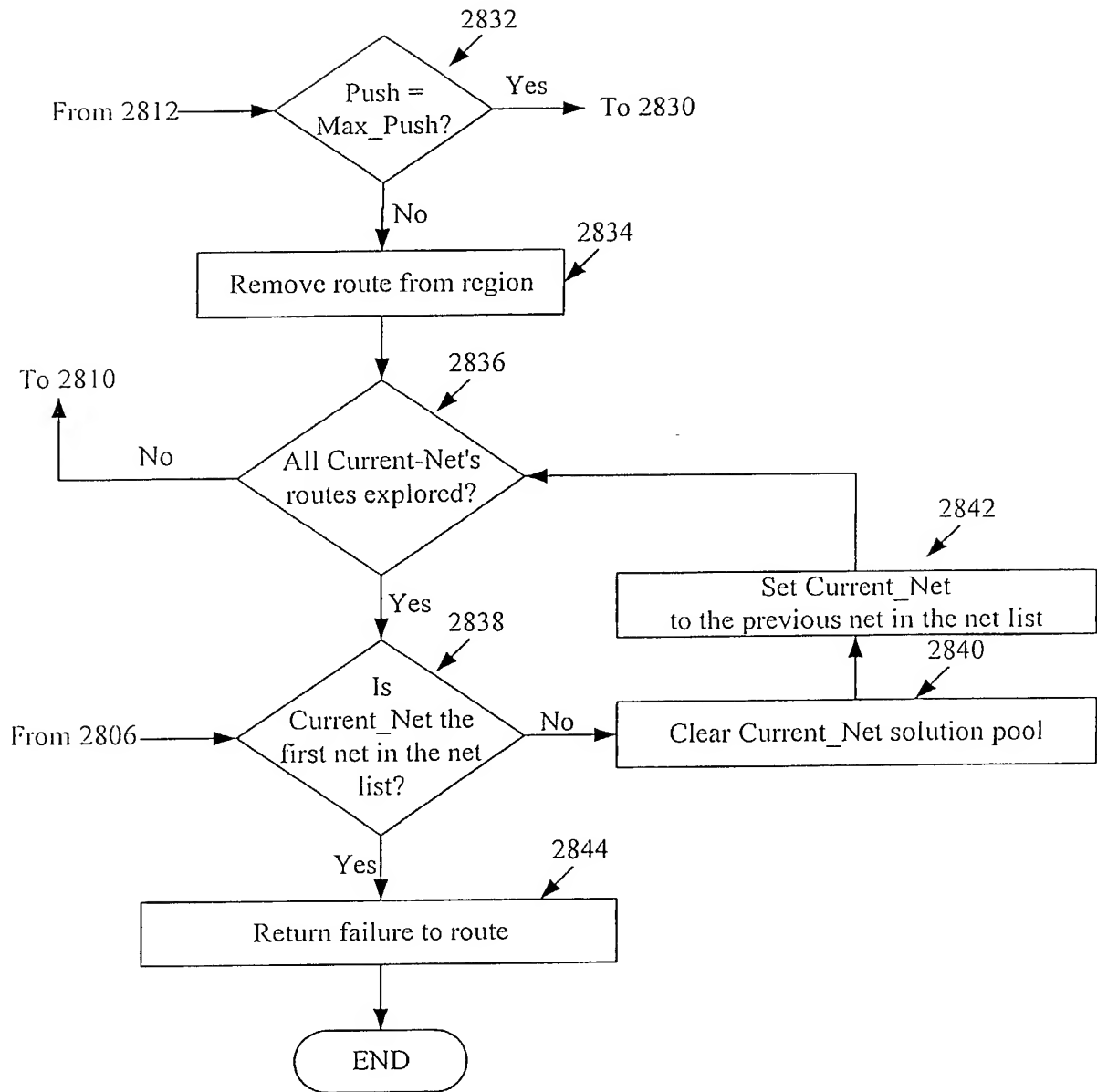
Figure 27



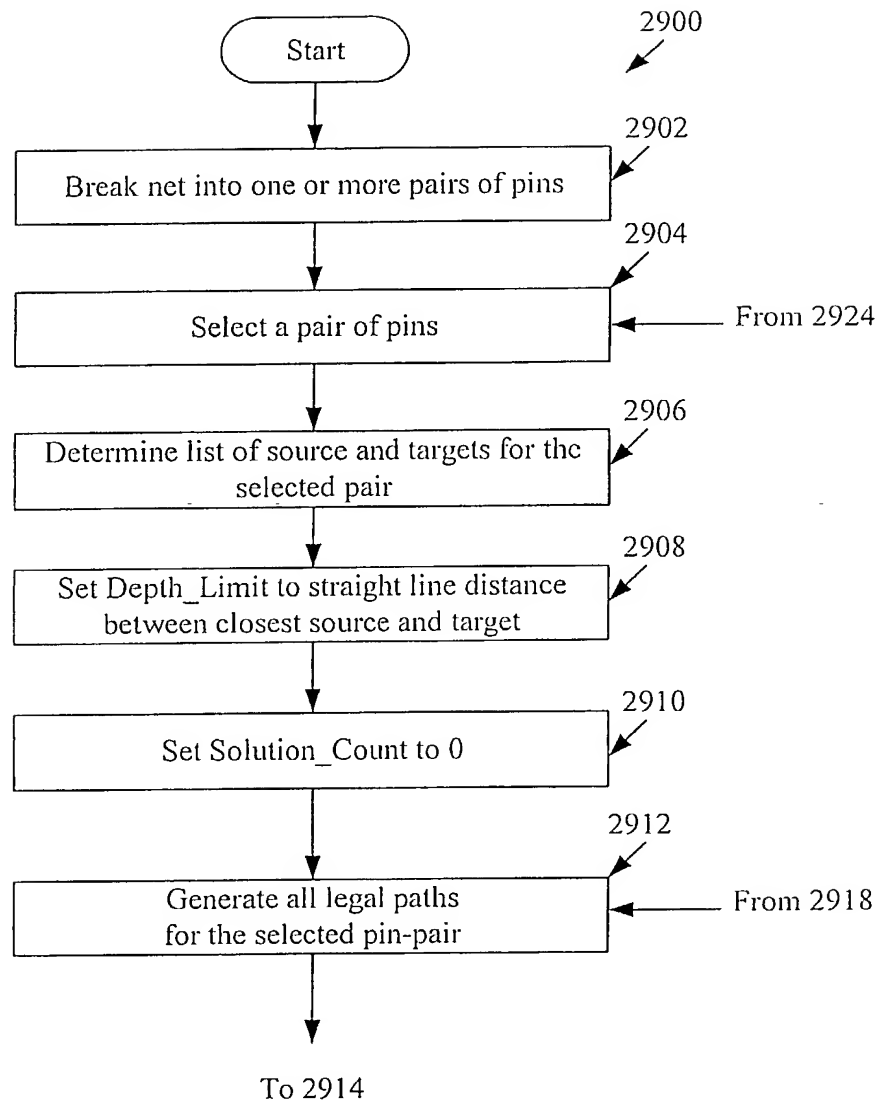
**Figure 28A**

**Figure 28:**  $\frac{\text{Figure 28A}}{\frac{\text{Figure 28B}}{\text{Figure 28C}}}$

*Figure 28B*

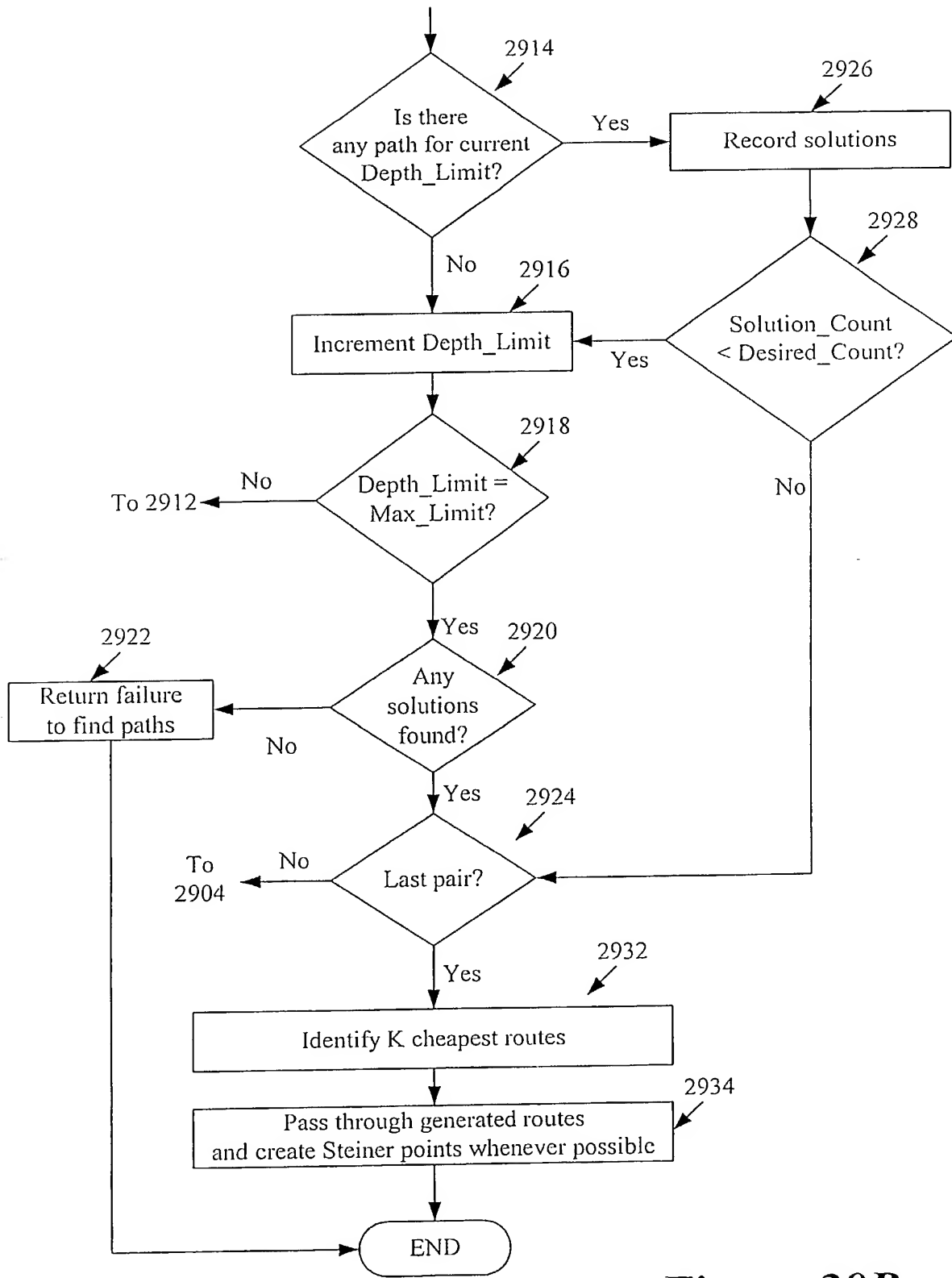
*Figure 28C*





**Figure 29A**

**Figure 29:**  $\frac{\text{Figure 29A}}{\text{Figure 29B}}$

*Figure 29B*

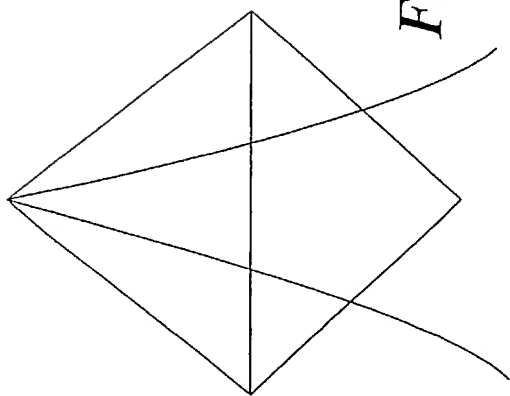


Figure 30A

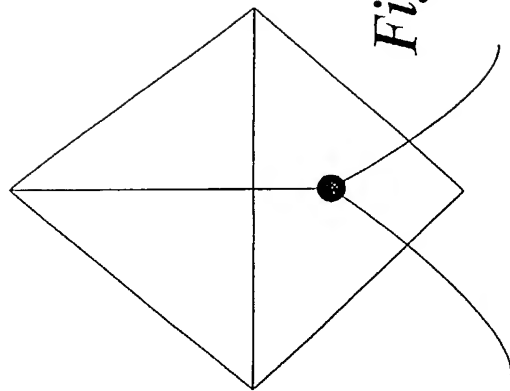


Figure 30B

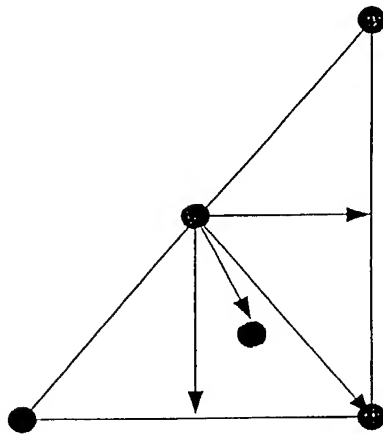


Figure 32

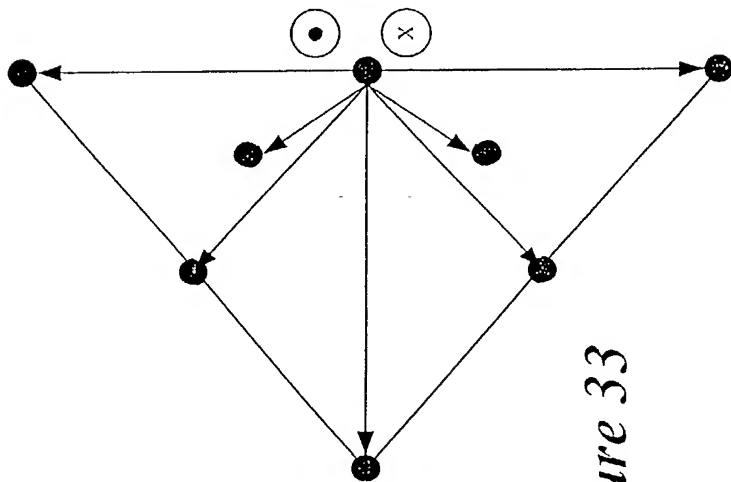


Figure 33

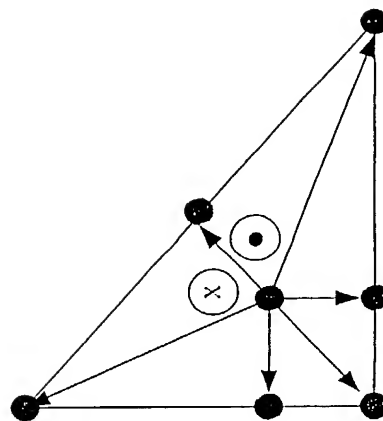
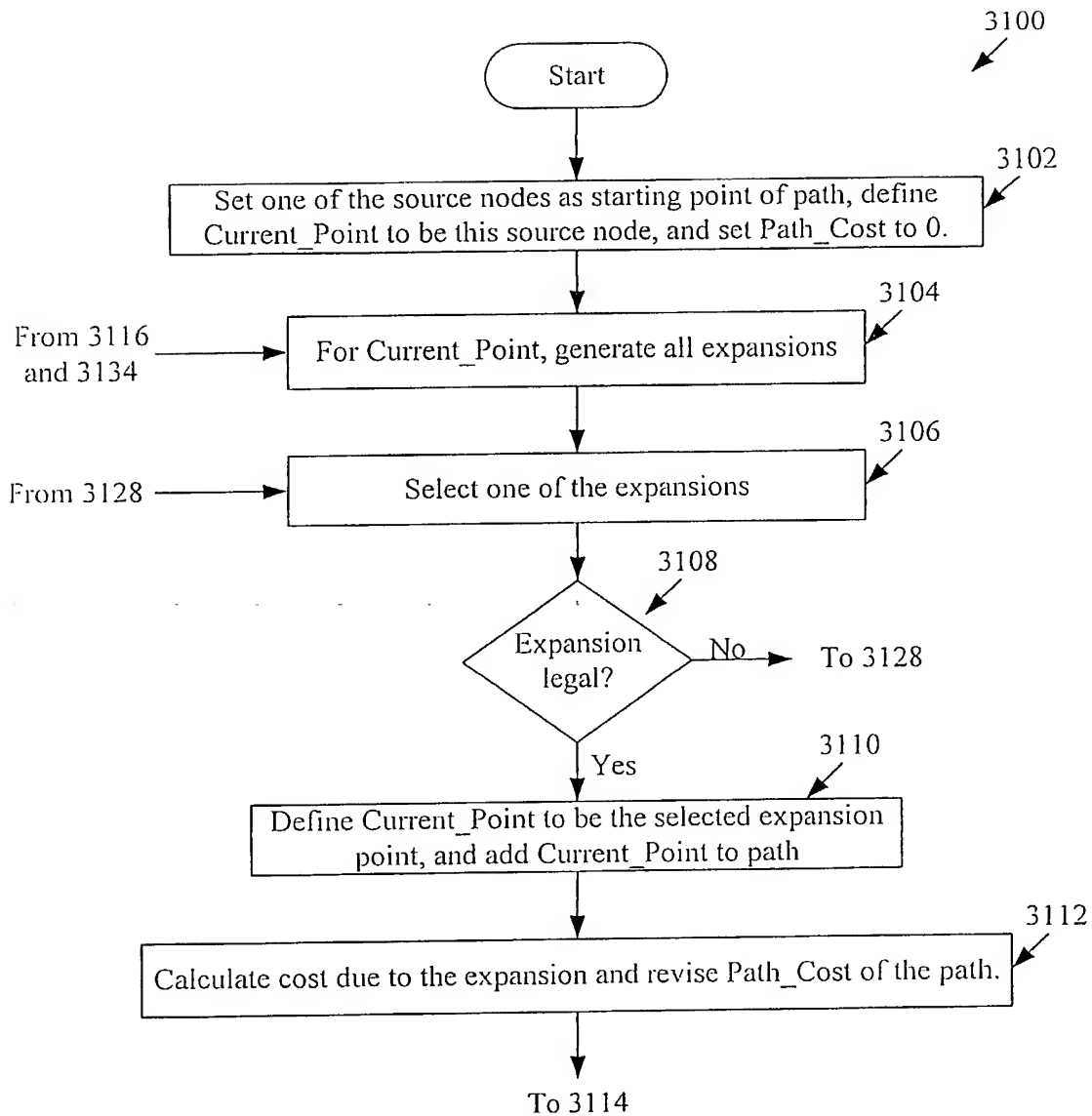
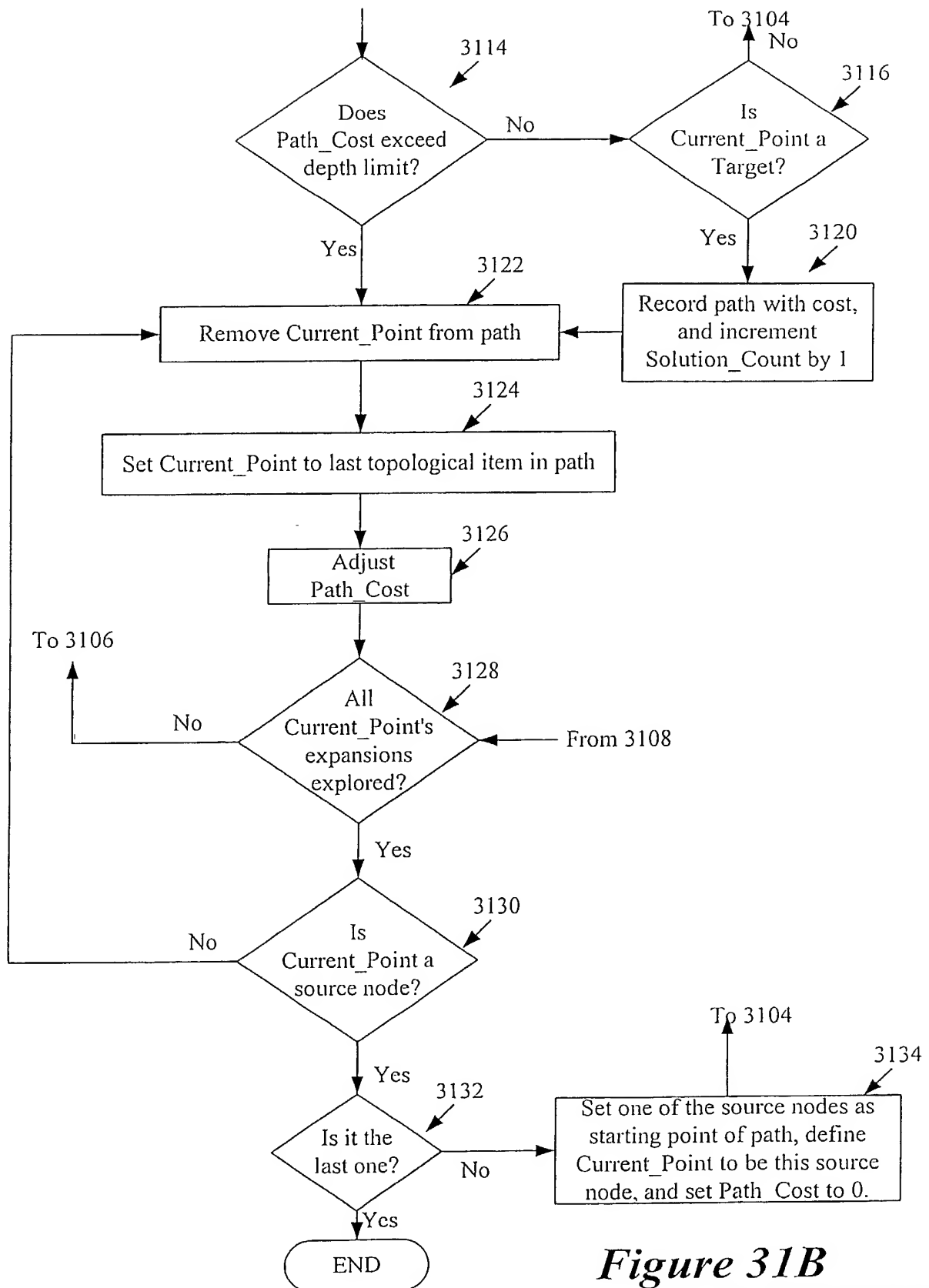


Figure 34



*Figure 31A*

*Figure 31:  $\frac{\text{Figure 31A}}{\text{Figure 31B}}$*



**Figure 31B**

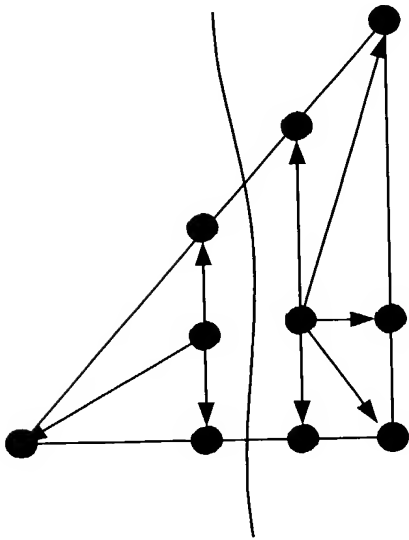


Figure 35

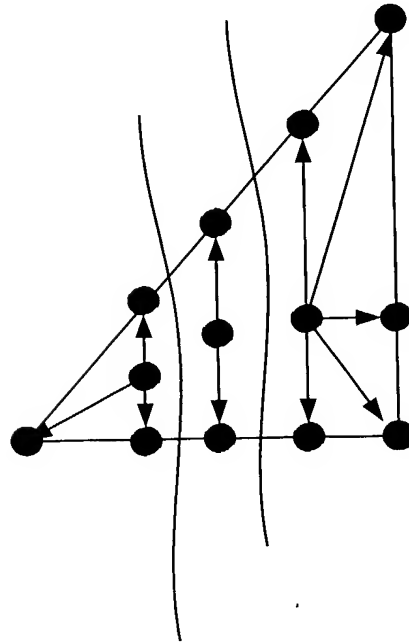


Figure 36

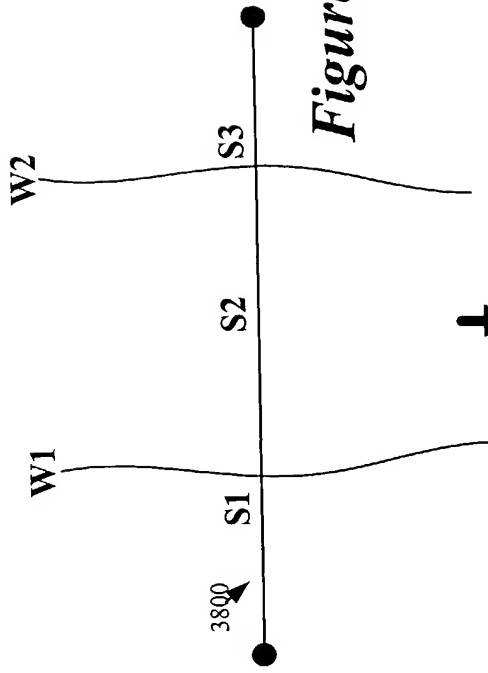


Figure 38A

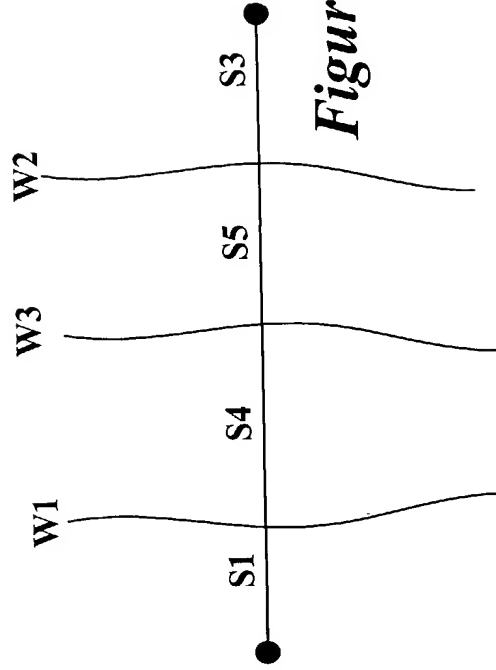
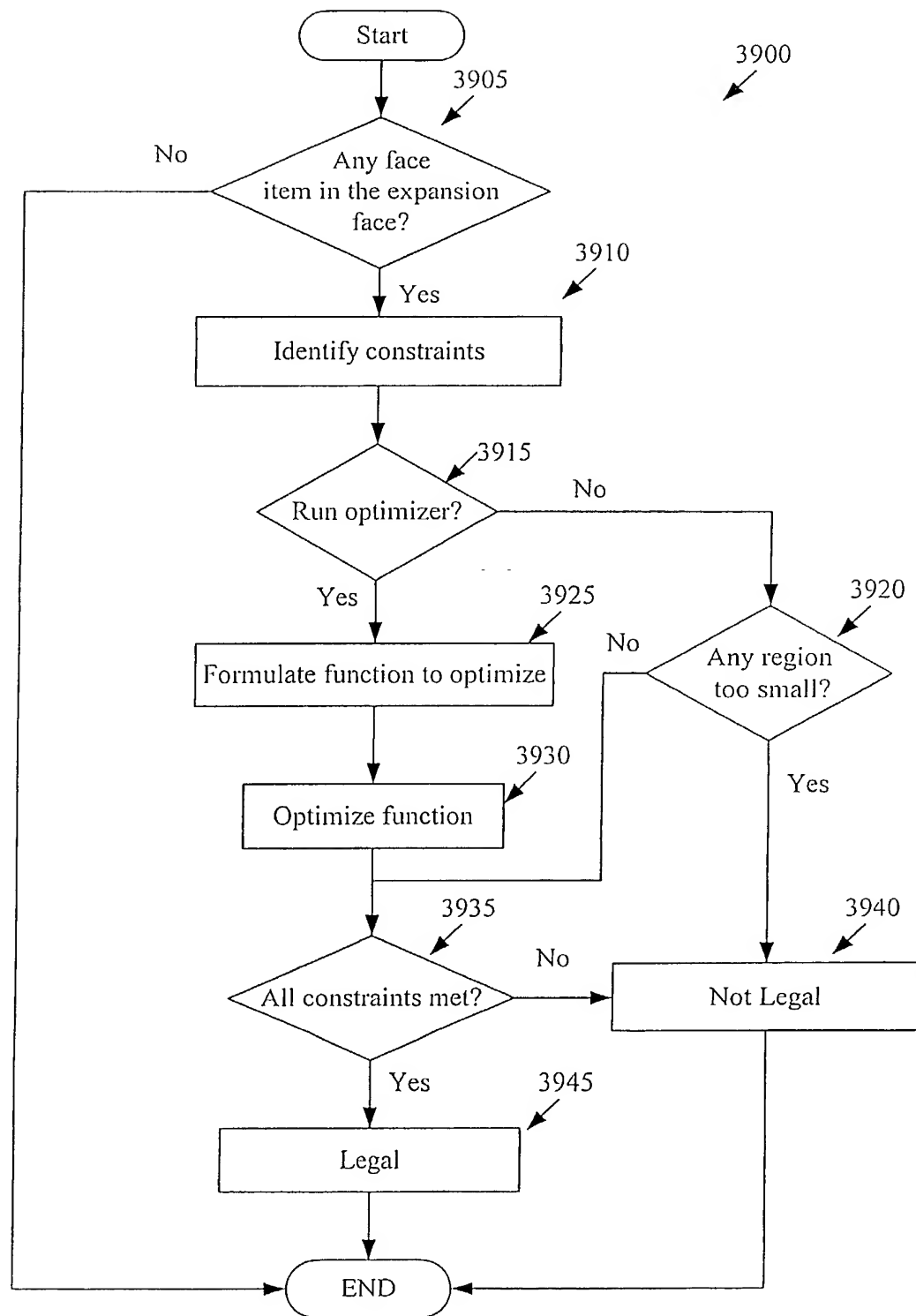


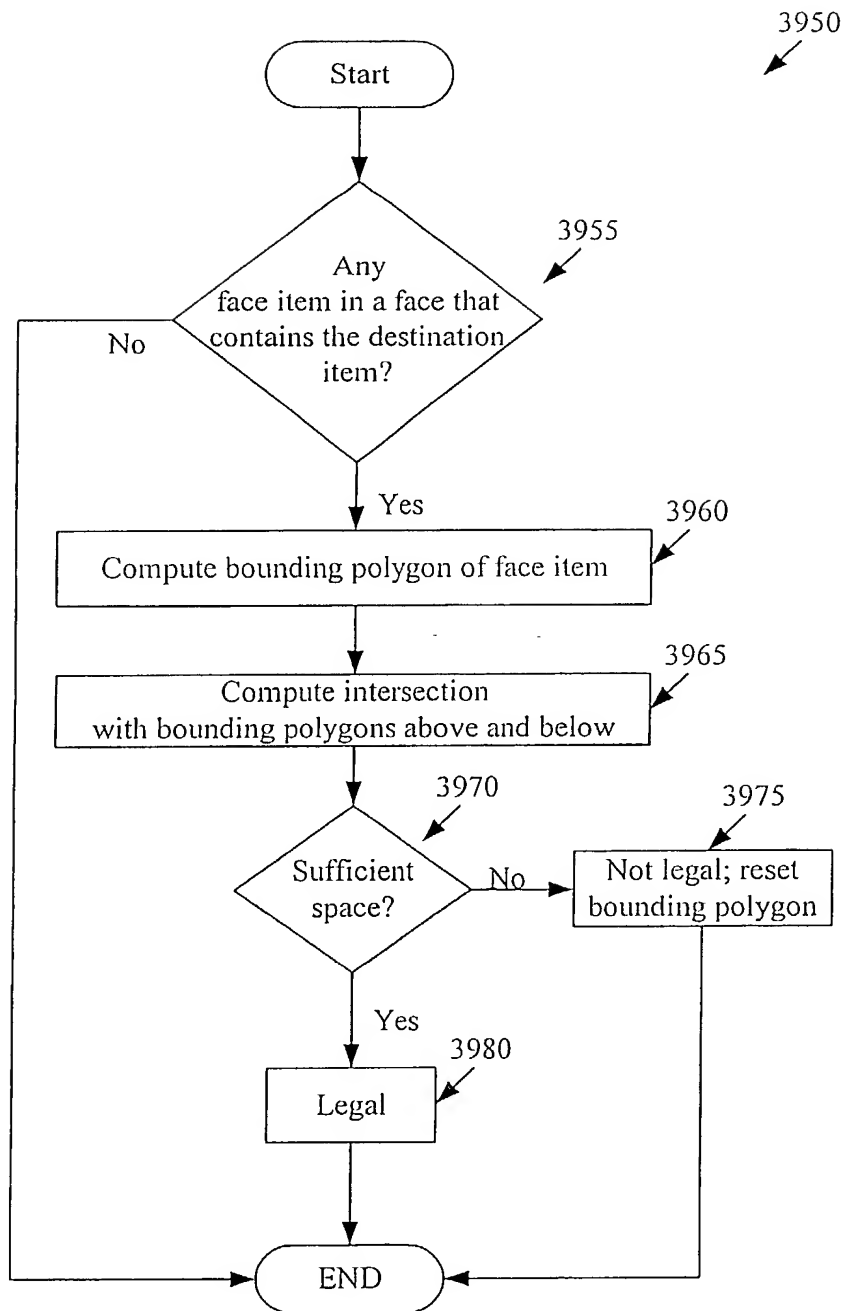
Figure 38B

To:		Node	Face Item	Edge Item
From:	Node	<ul style="list-style-type: none"> <li>• Planarity</li> <li>• Vias</li> </ul>	<ul style="list-style-type: none"> <li>• Vias</li> </ul>	<ul style="list-style-type: none"> <li>• Planarity</li> <li>• Vias</li> <li>• Edge</li> <li>• Capacity</li> </ul>
	Face Item	<ul style="list-style-type: none"> <li>• Vias</li> </ul>		<ul style="list-style-type: none"> <li>• Vias</li> <li>• Edge</li> <li>• Capacity</li> </ul>
	Edge Item	<ul style="list-style-type: none"> <li>• Planarity</li> <li>• Vias</li> </ul>	<ul style="list-style-type: none"> <li>• Vias</li> </ul>	<ul style="list-style-type: none"> <li>• Planarity</li> <li>• Vias</li> <li>• Edge</li> <li>• Capacity</li> </ul>

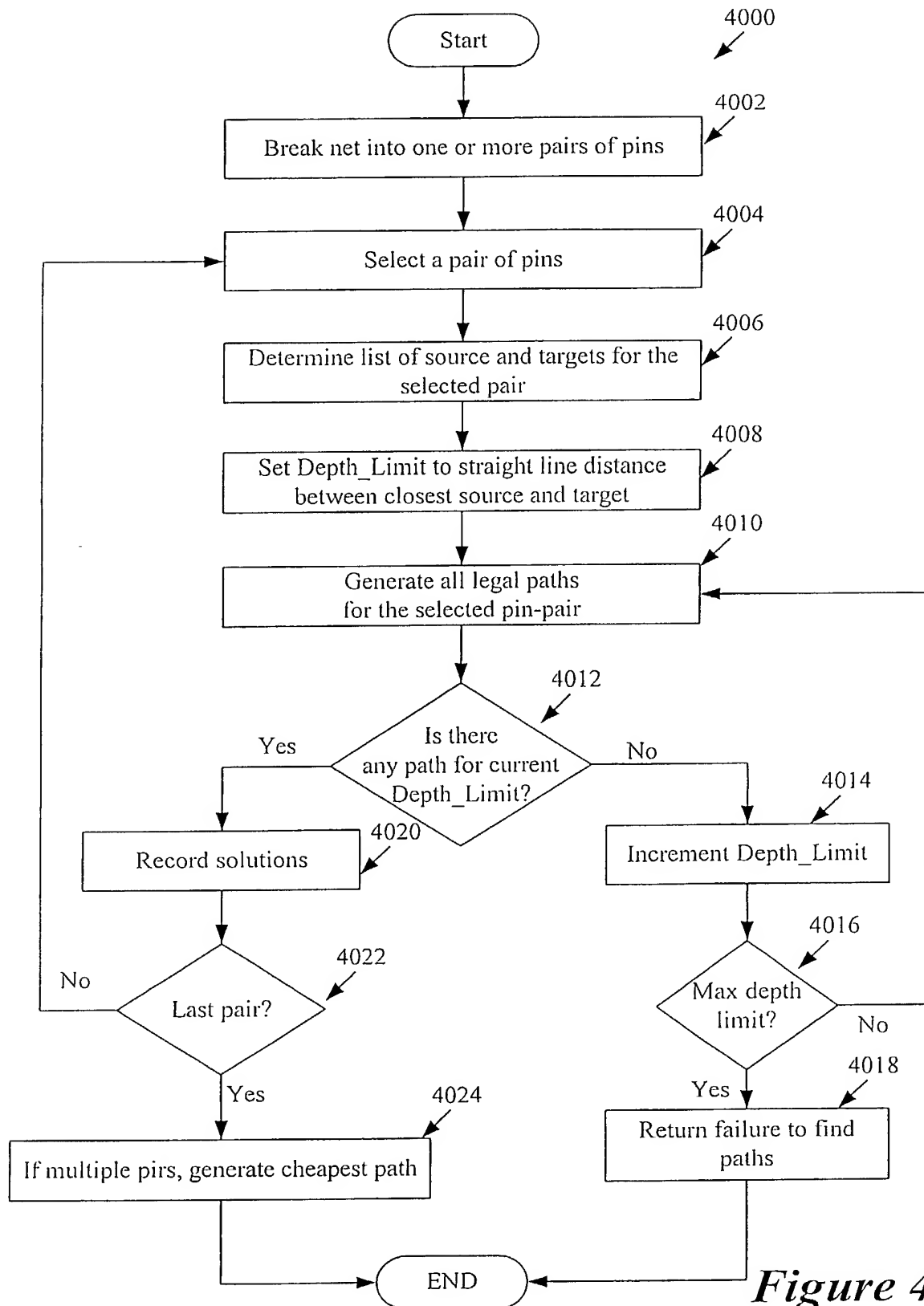
*Figure 37*

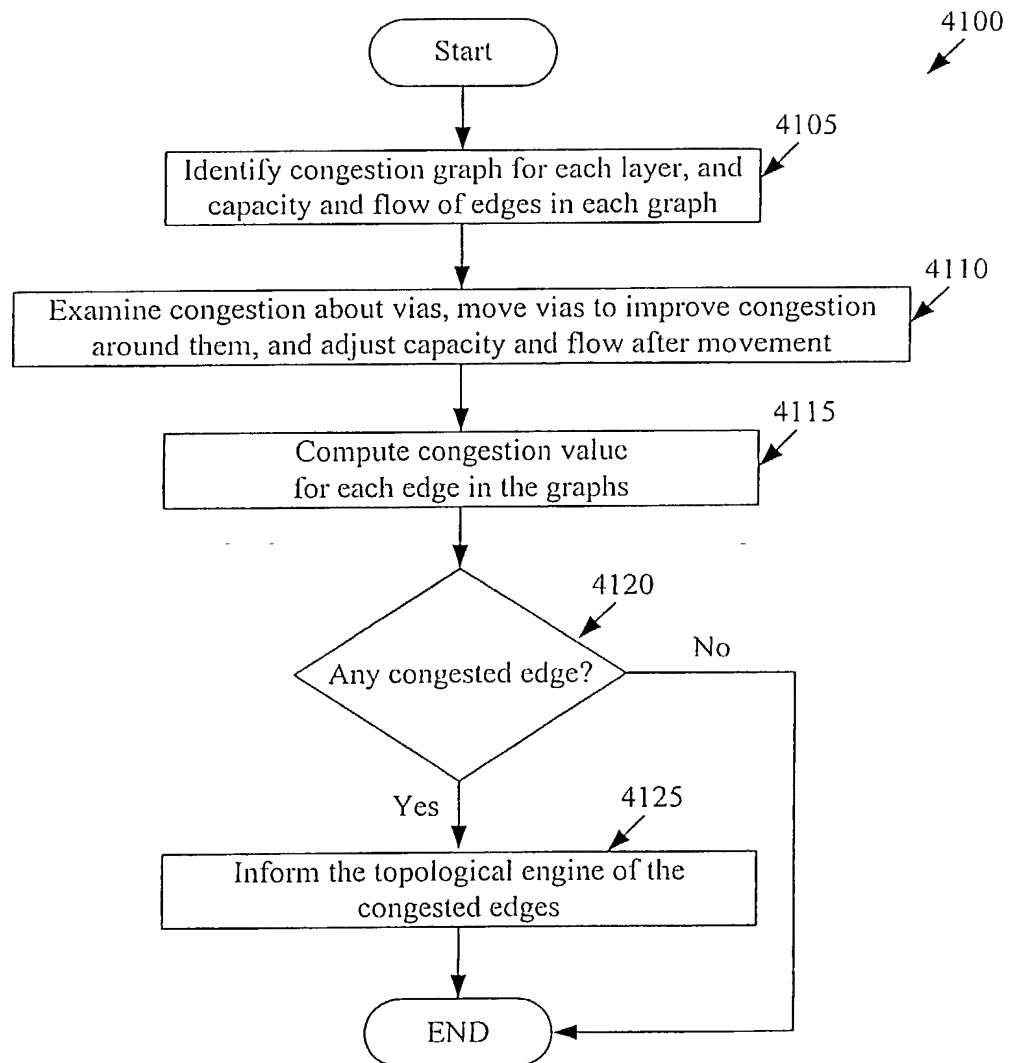
*Figure 39A*





**Figure 39B**

*Figure 40*



*Figure 41*

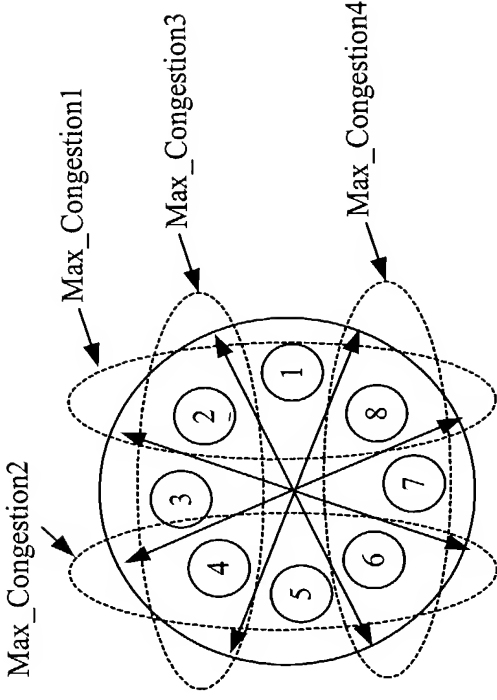


Figure 44

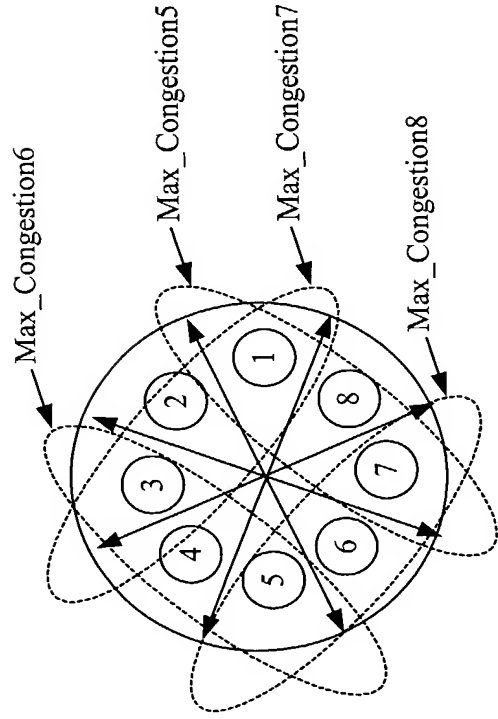


Figure 45

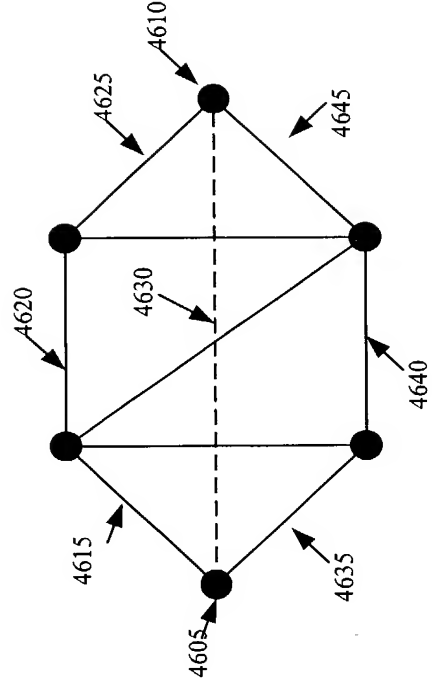
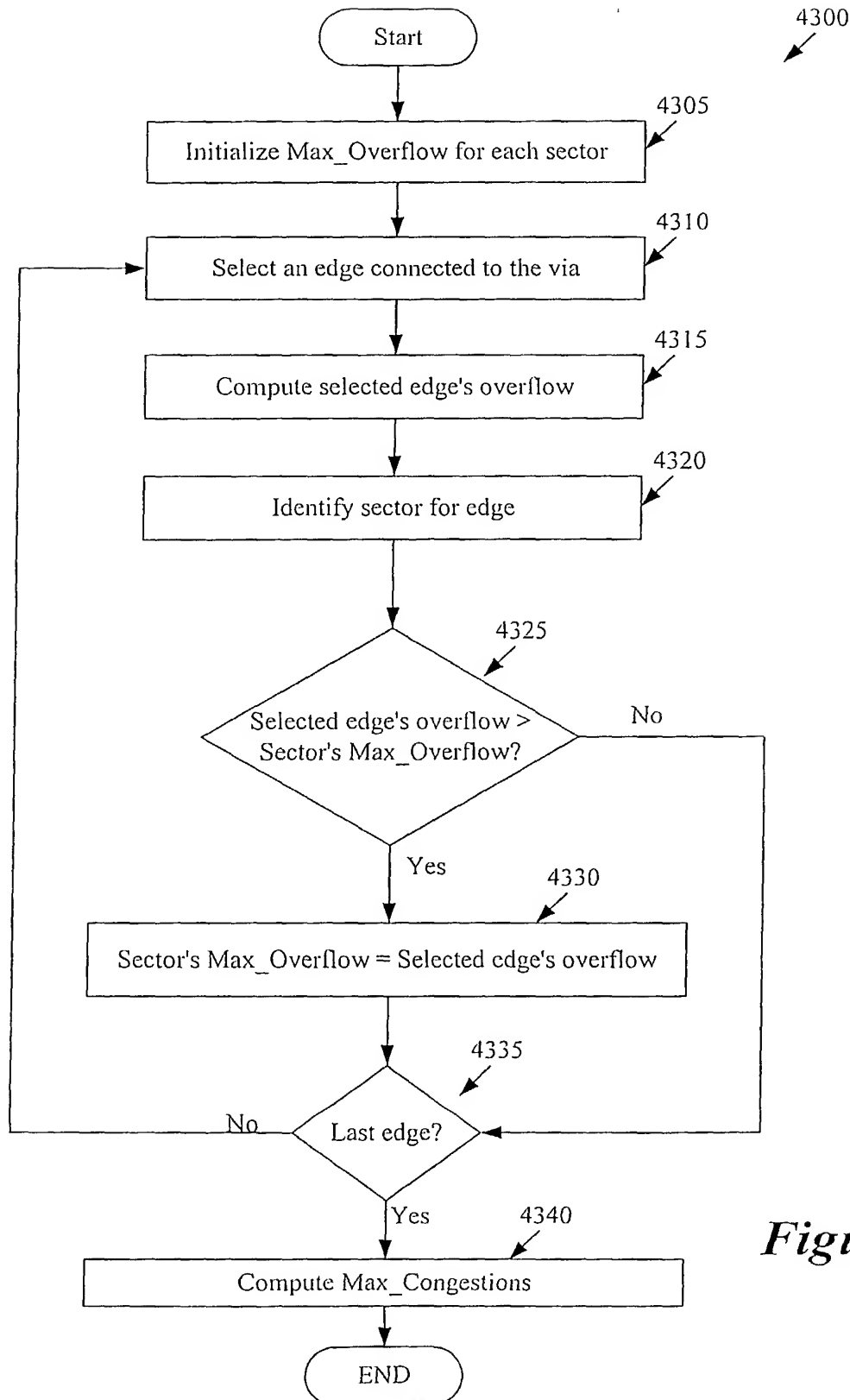
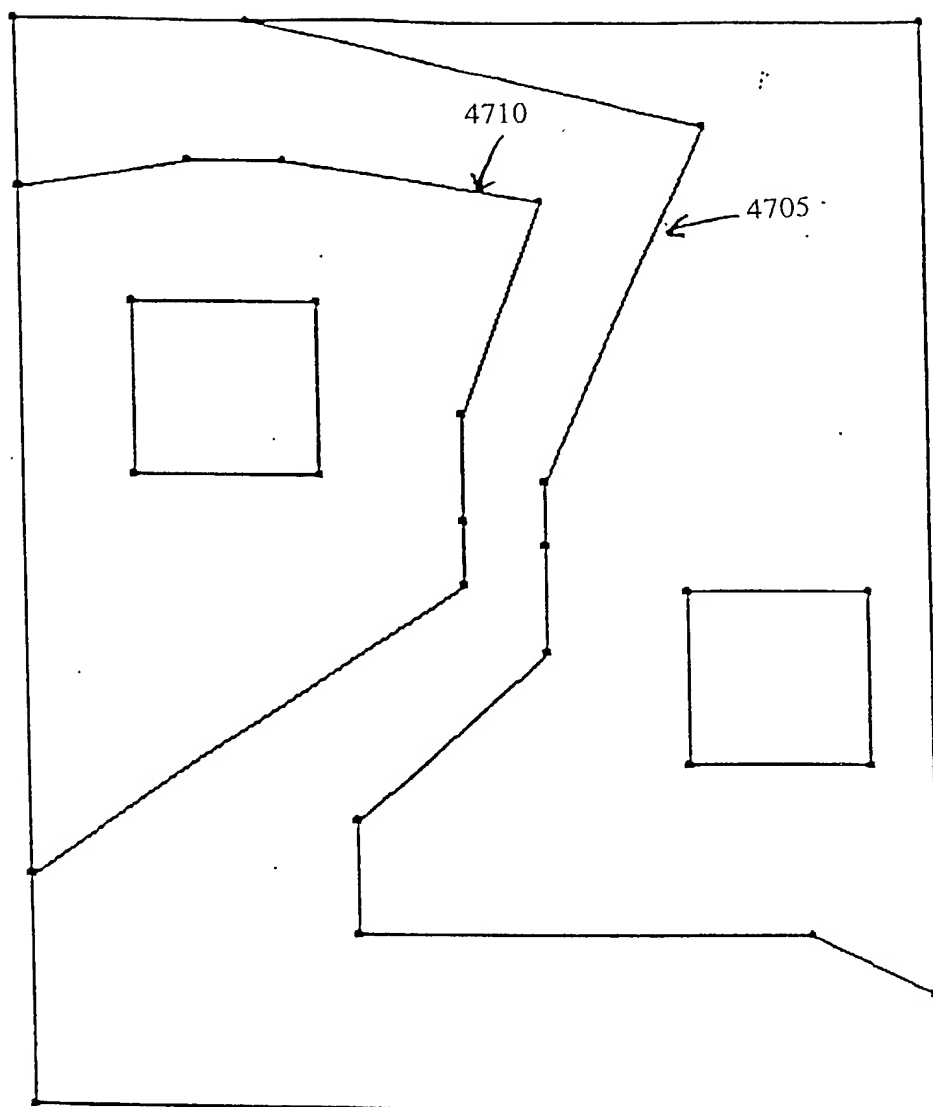


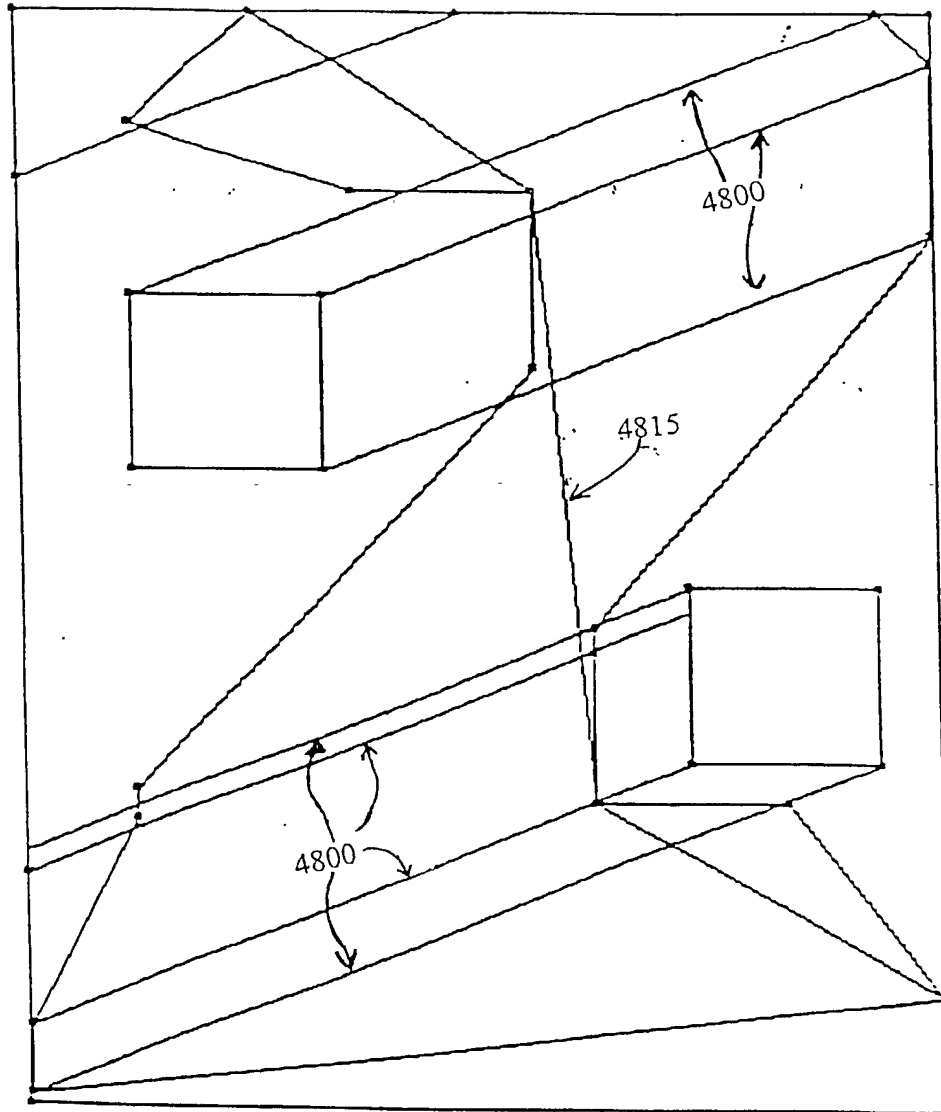
Figure 46

Figure 42

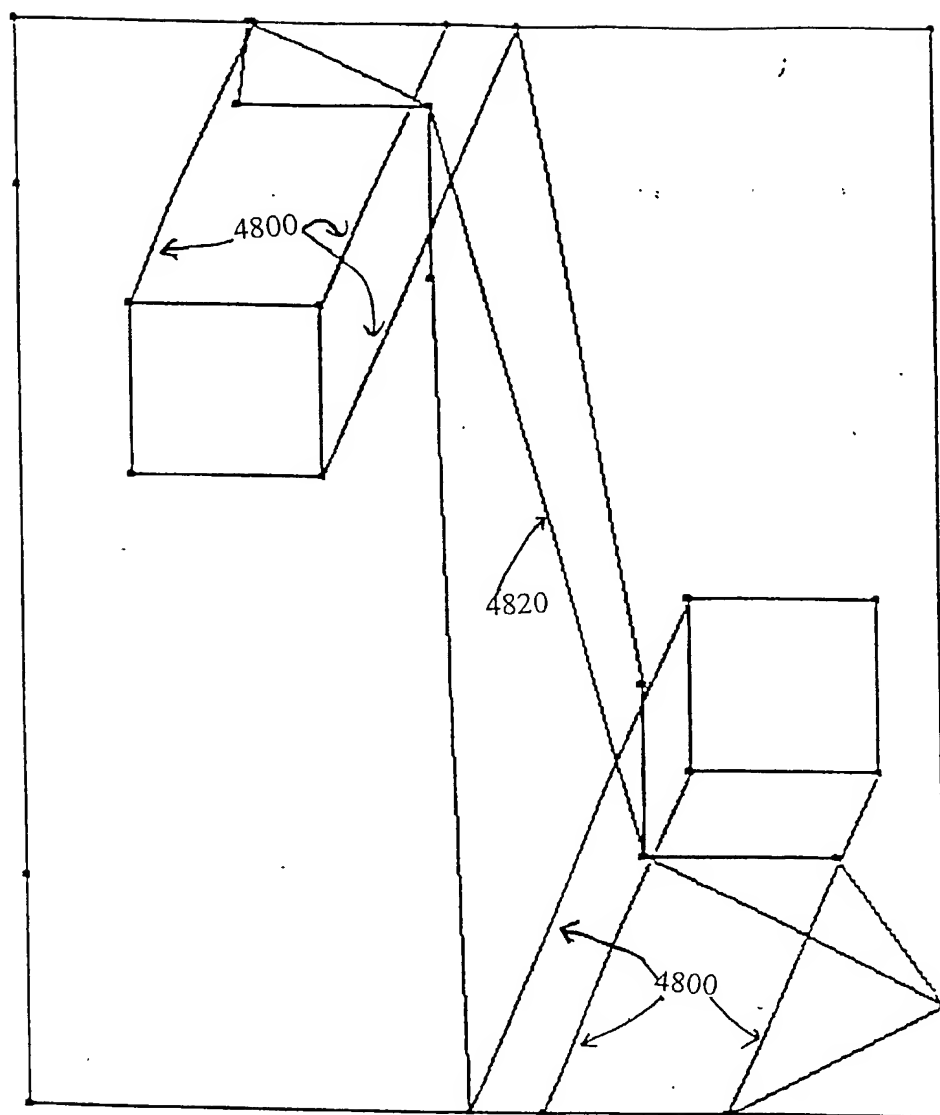




**FIGURE 47**

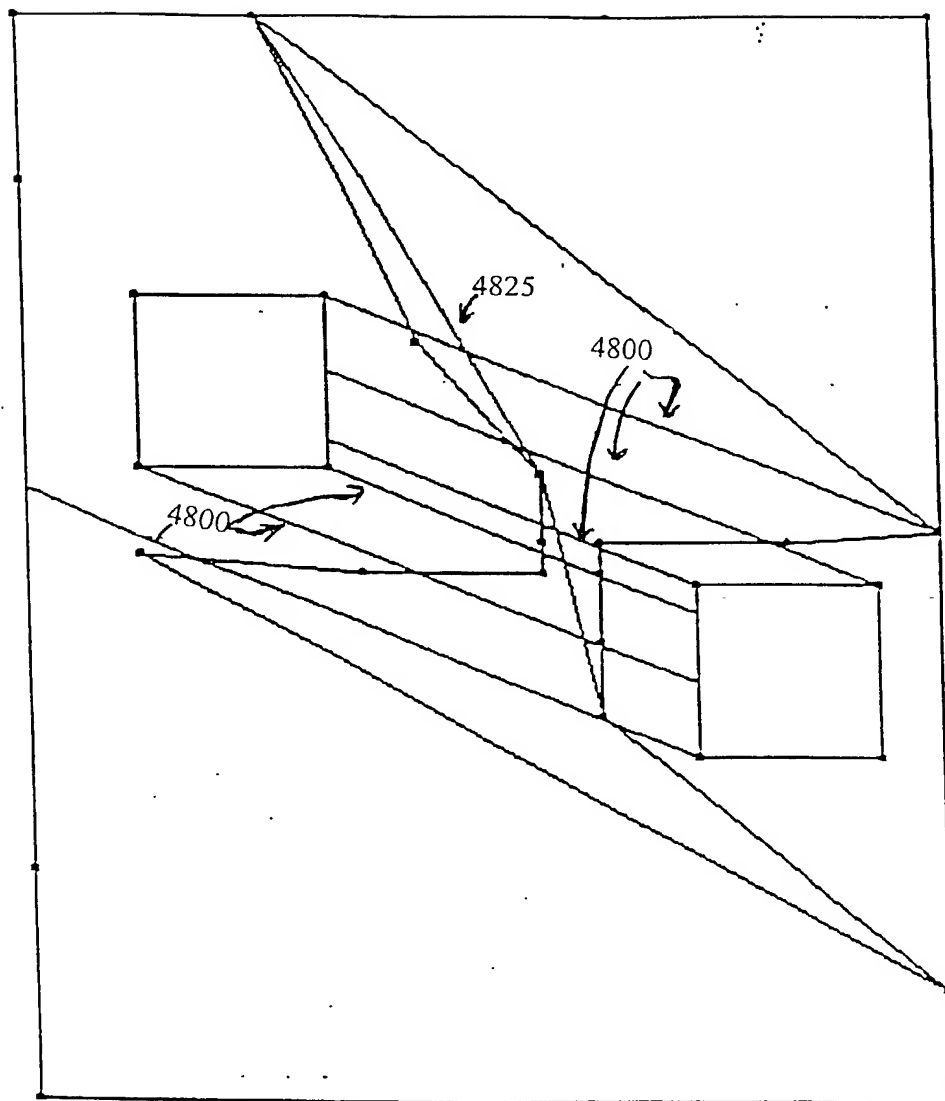


*FIGURE 48A*

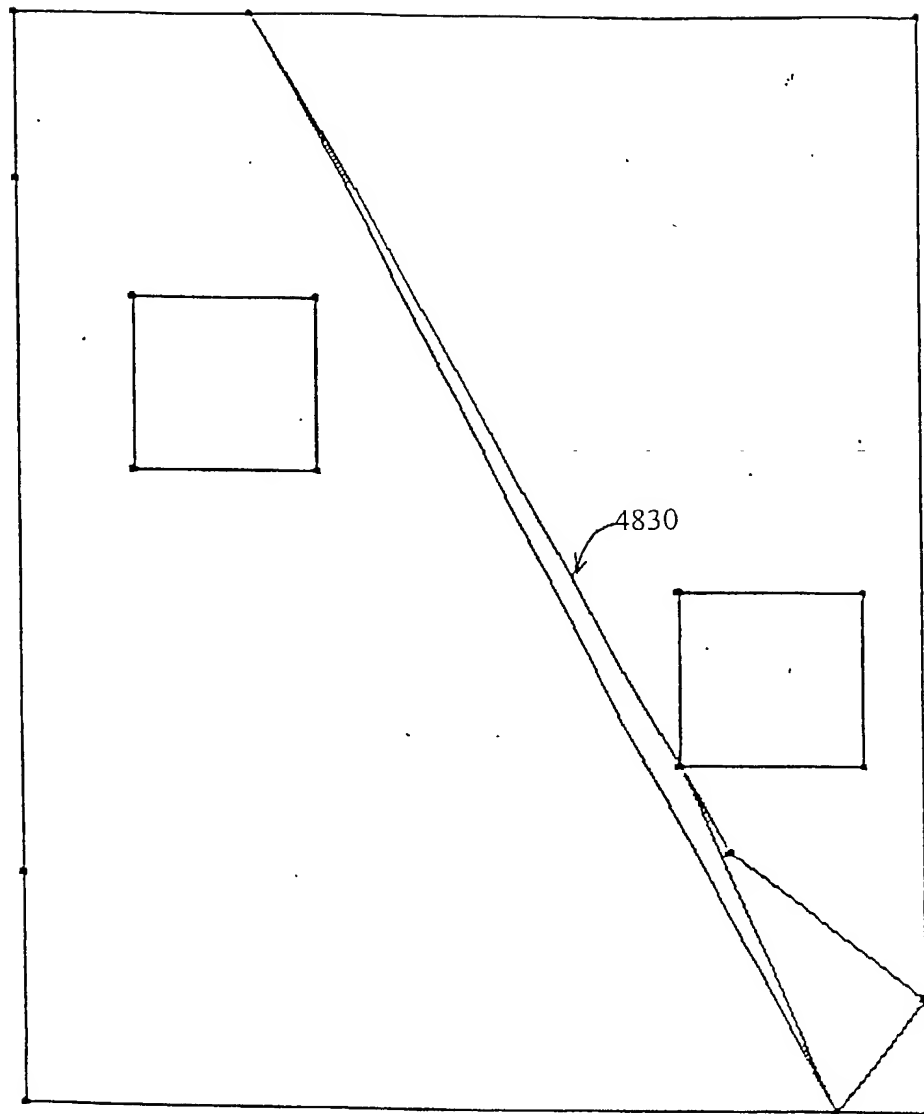


**FIGURE 48B**





**FIGURE 48C**



*FIGURE 48D*



Figure 49A

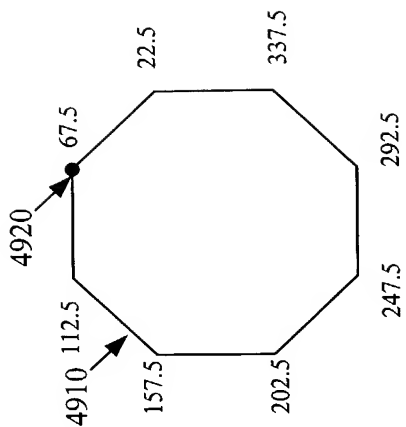


Figure 49B

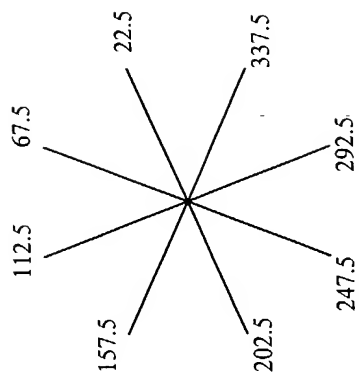
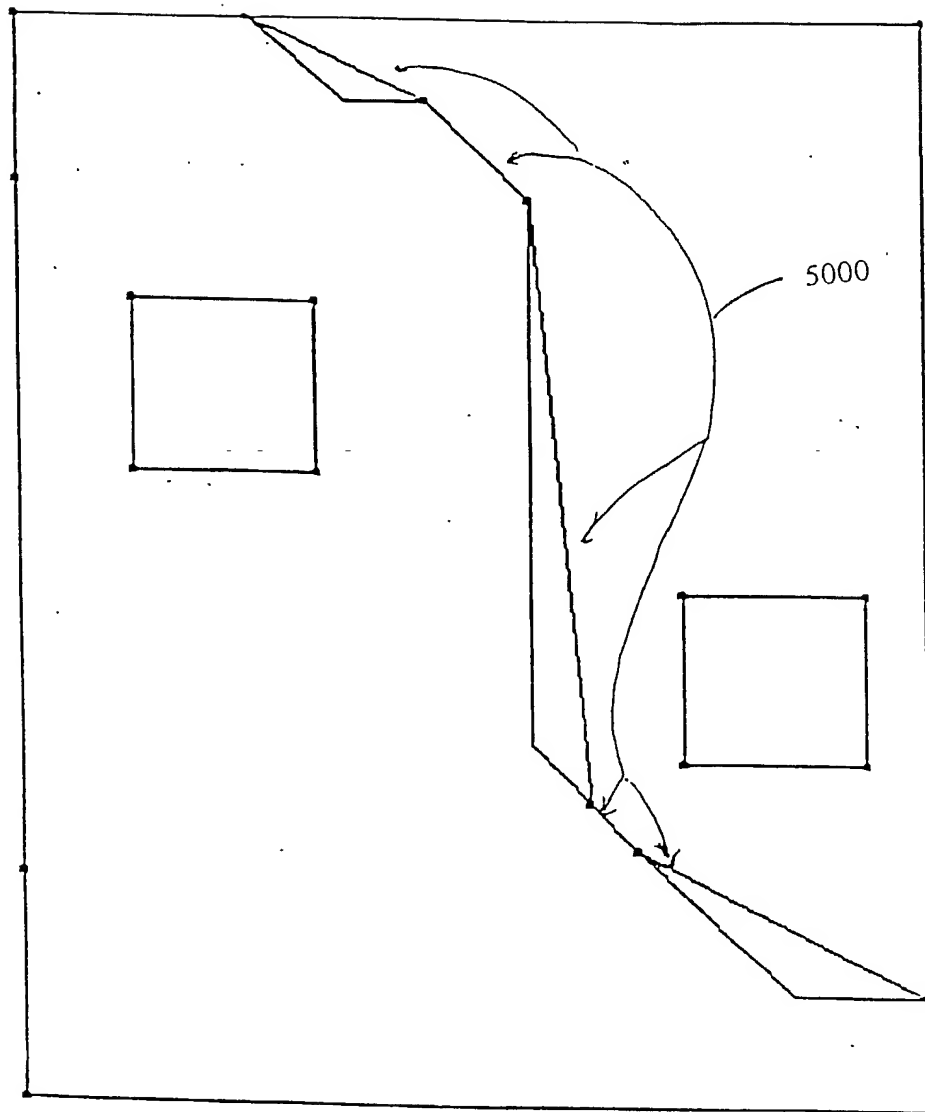


Figure 49C



**FIGURE 50**

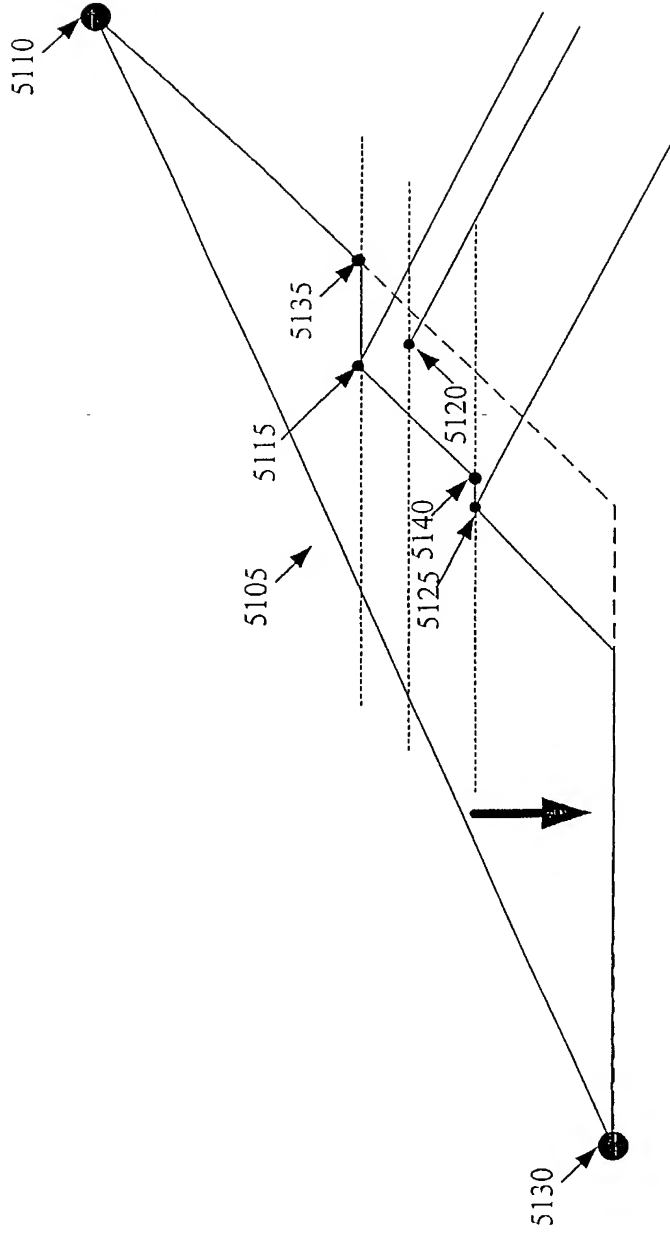
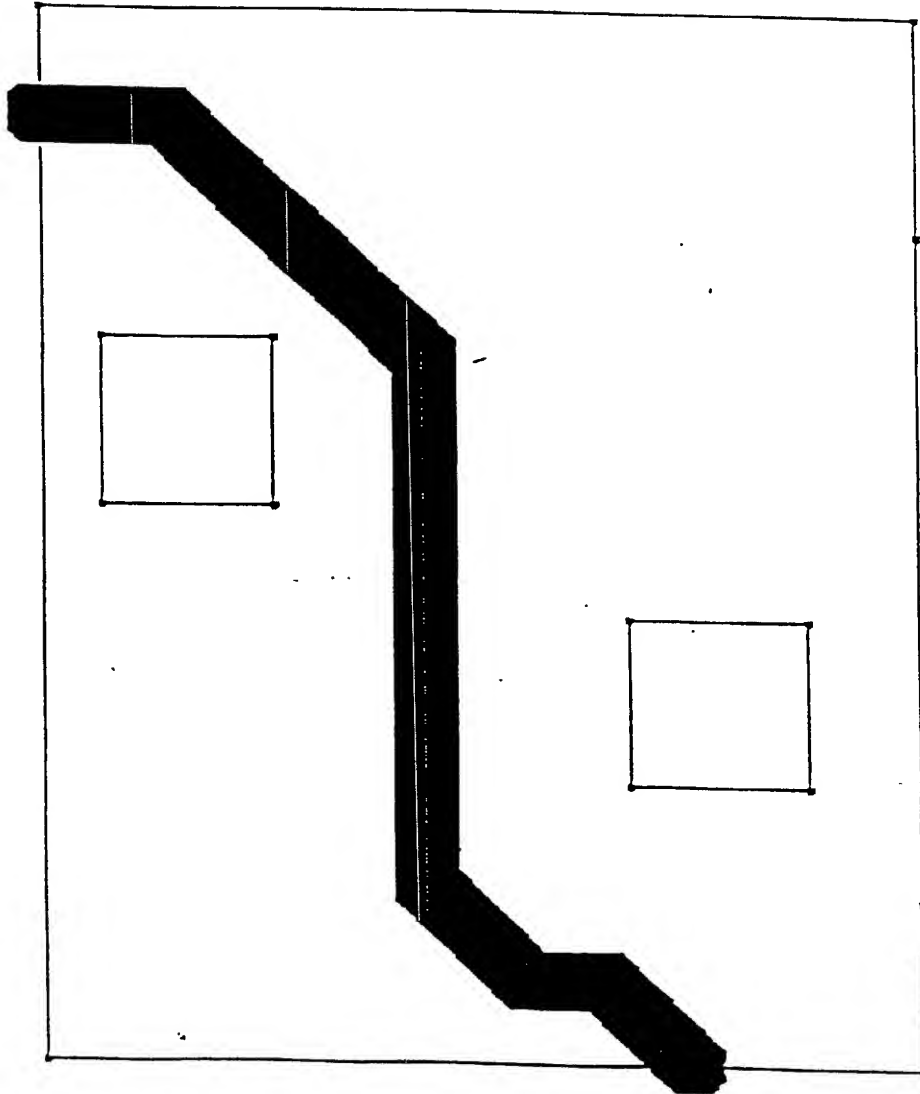
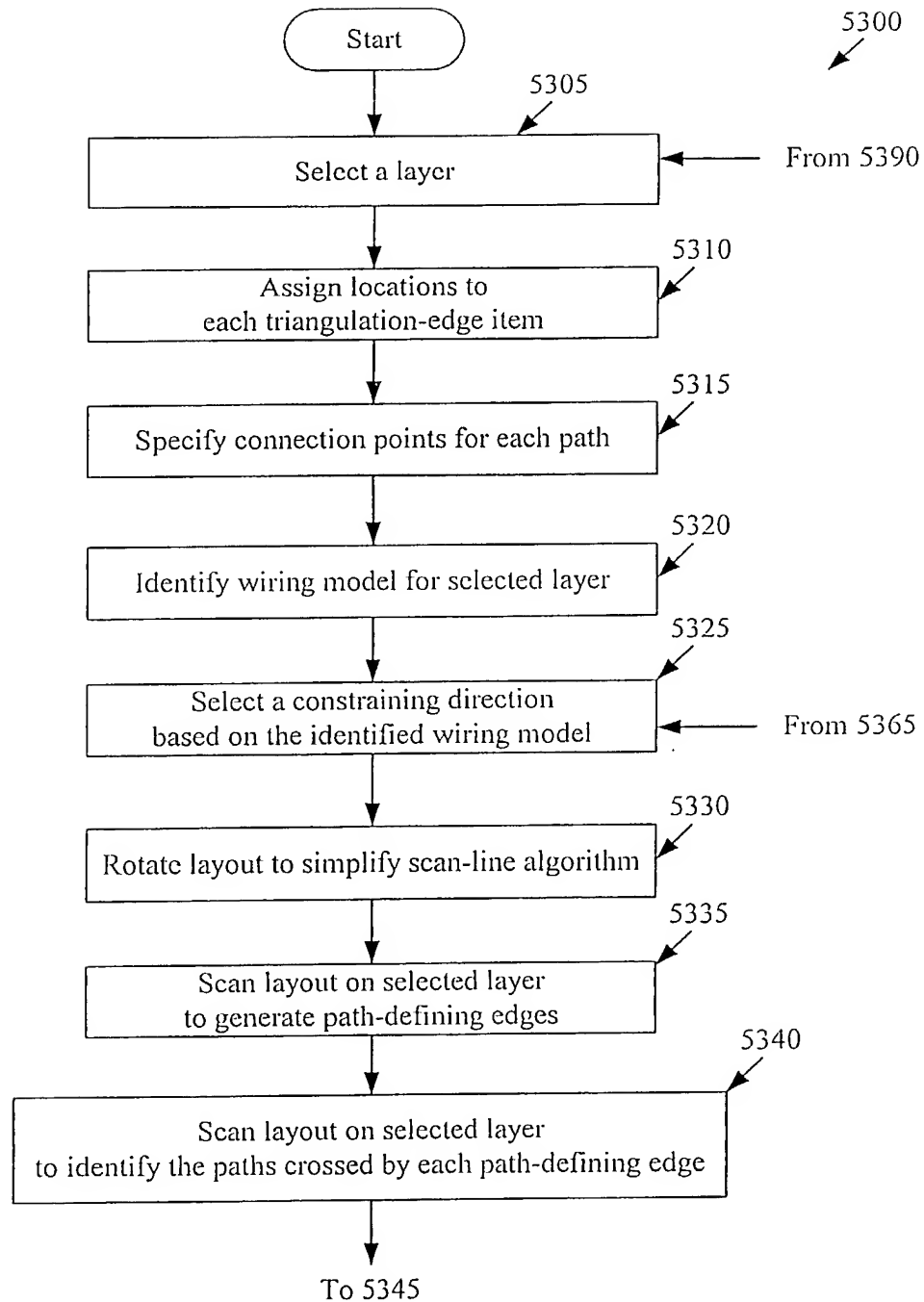


Figure 51

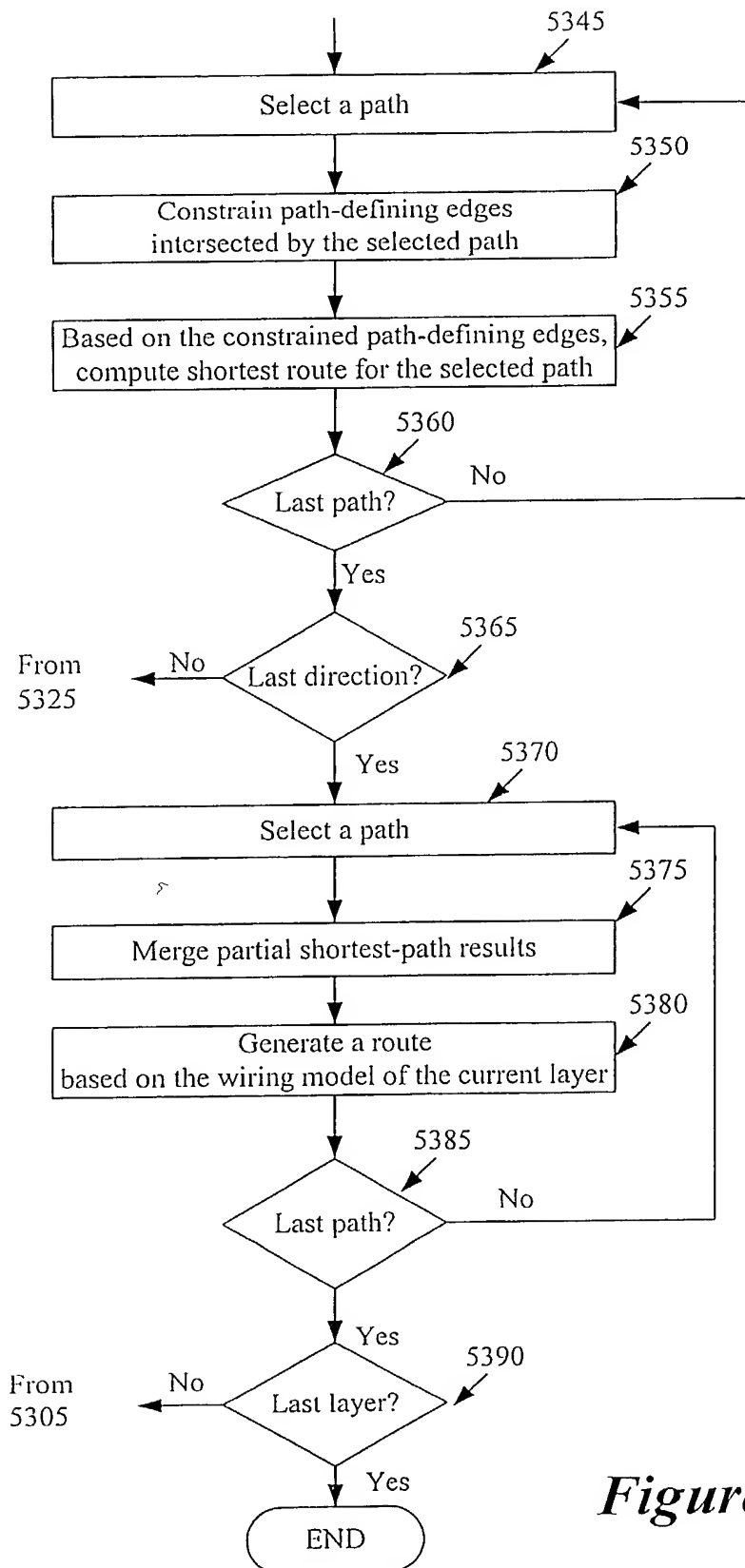


*FIGURE 52*



**Figure 53**

**Figure 53:** Figure 53A  
Figure 53B



*Figure 53B*



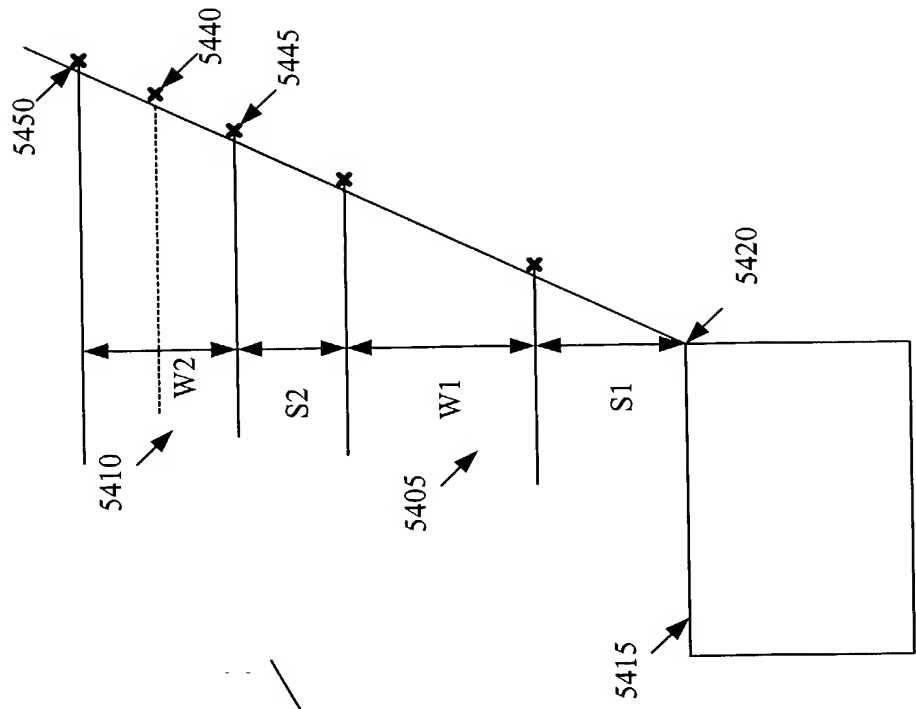


Figure 54

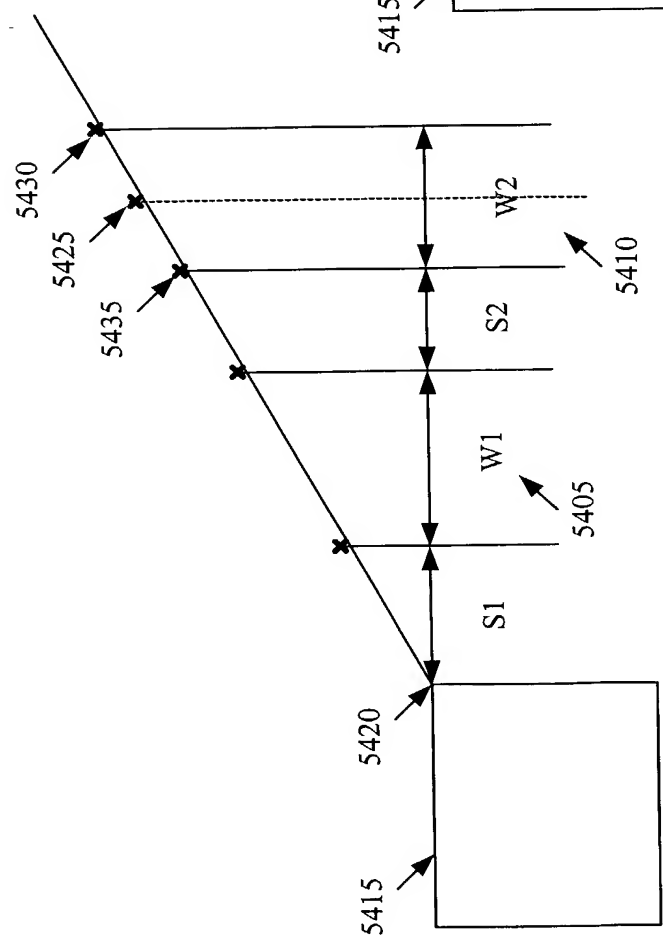


Figure 55

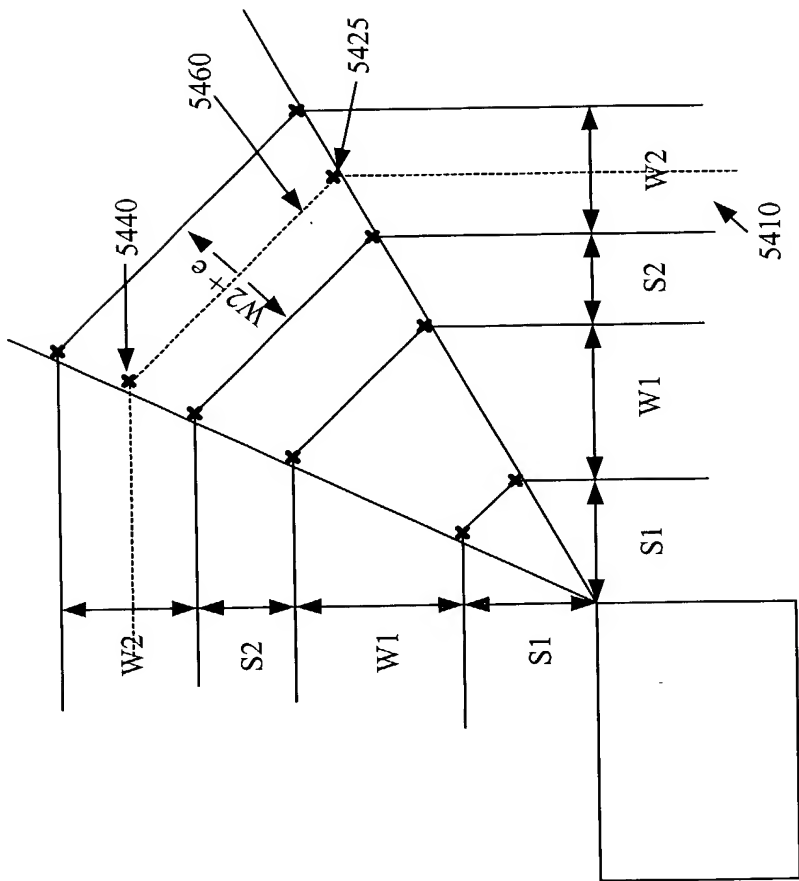


Figure 56

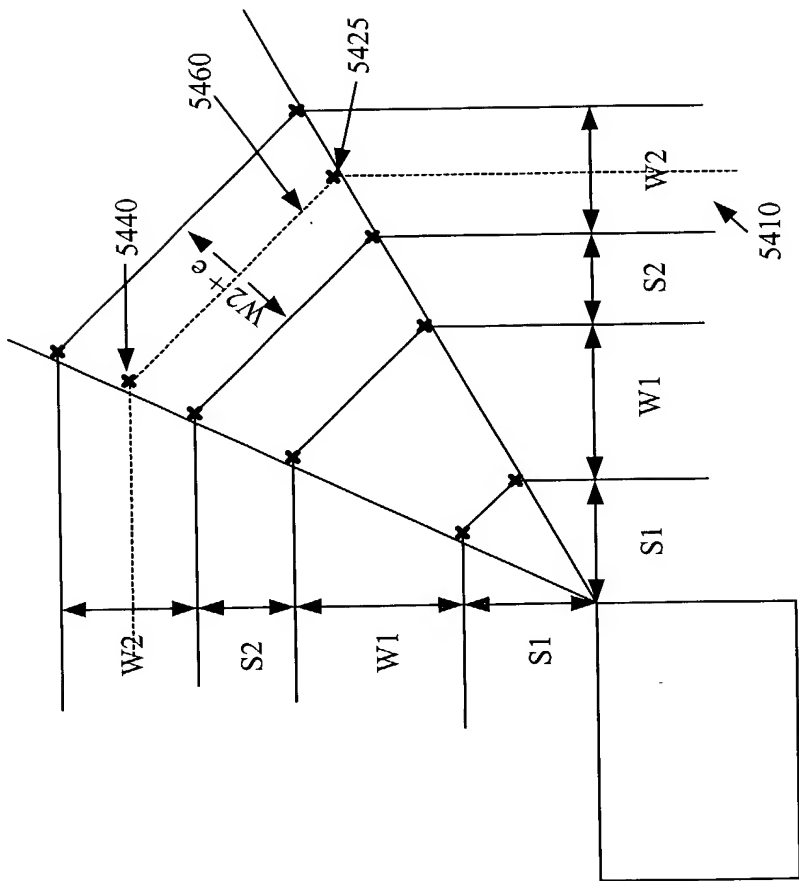


Figure 57

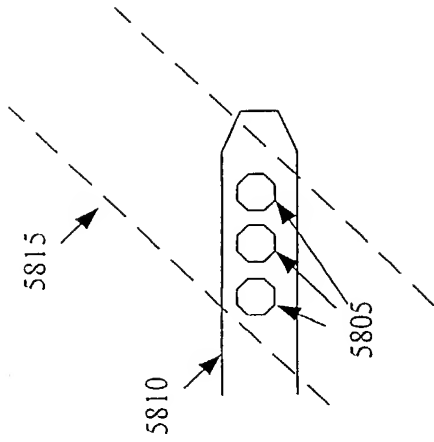


Figure 59

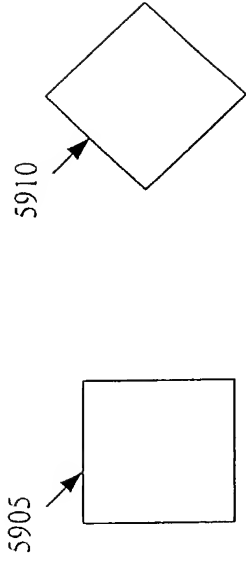


Figure 58

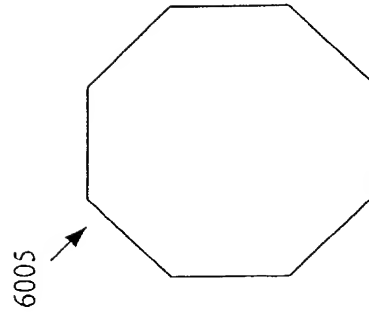


Figure 60

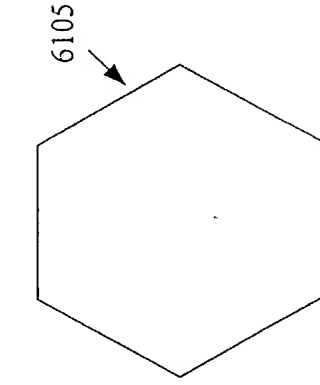


Figure 61

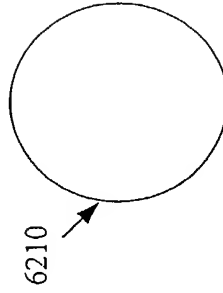


Figure 62

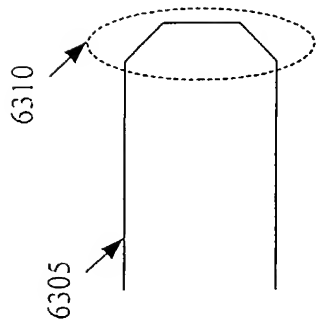


Figure 63

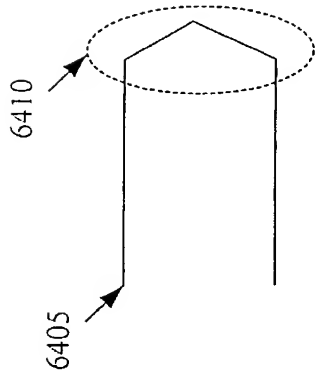


Figure 64

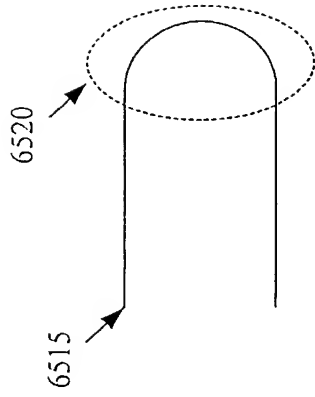
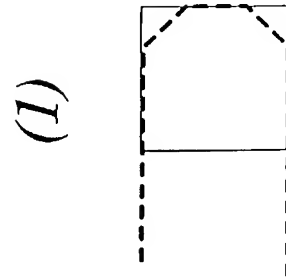
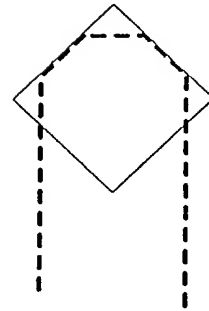


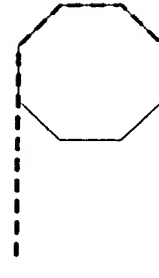
Figure 65



(1)



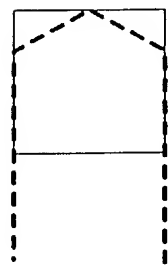
(2)



(3)

Figure 66

(1)



(2)

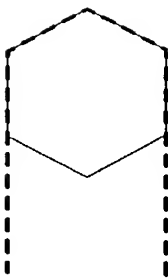


Figure 67

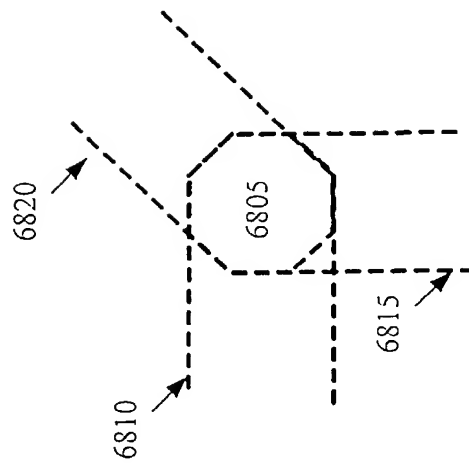


Figure 68

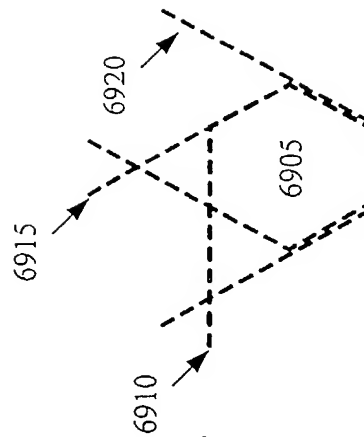


Figure 69

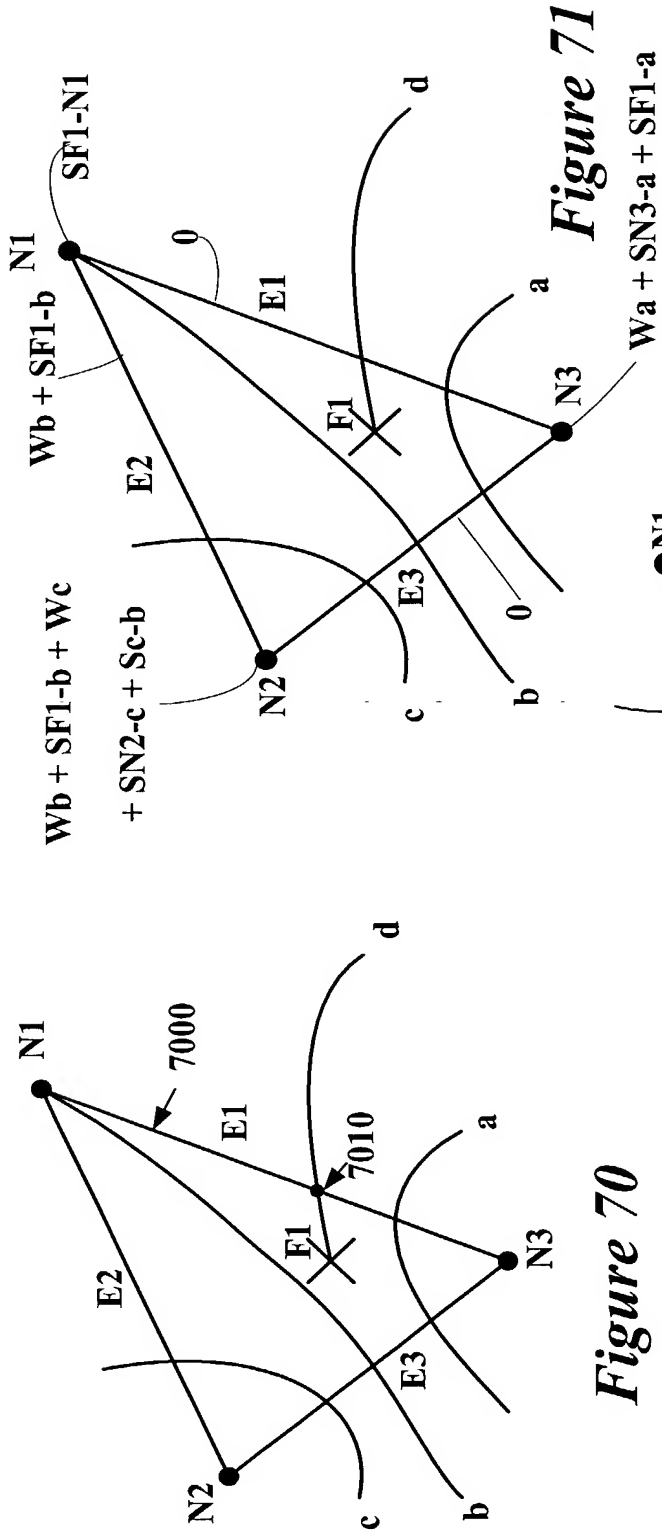


Figure 70

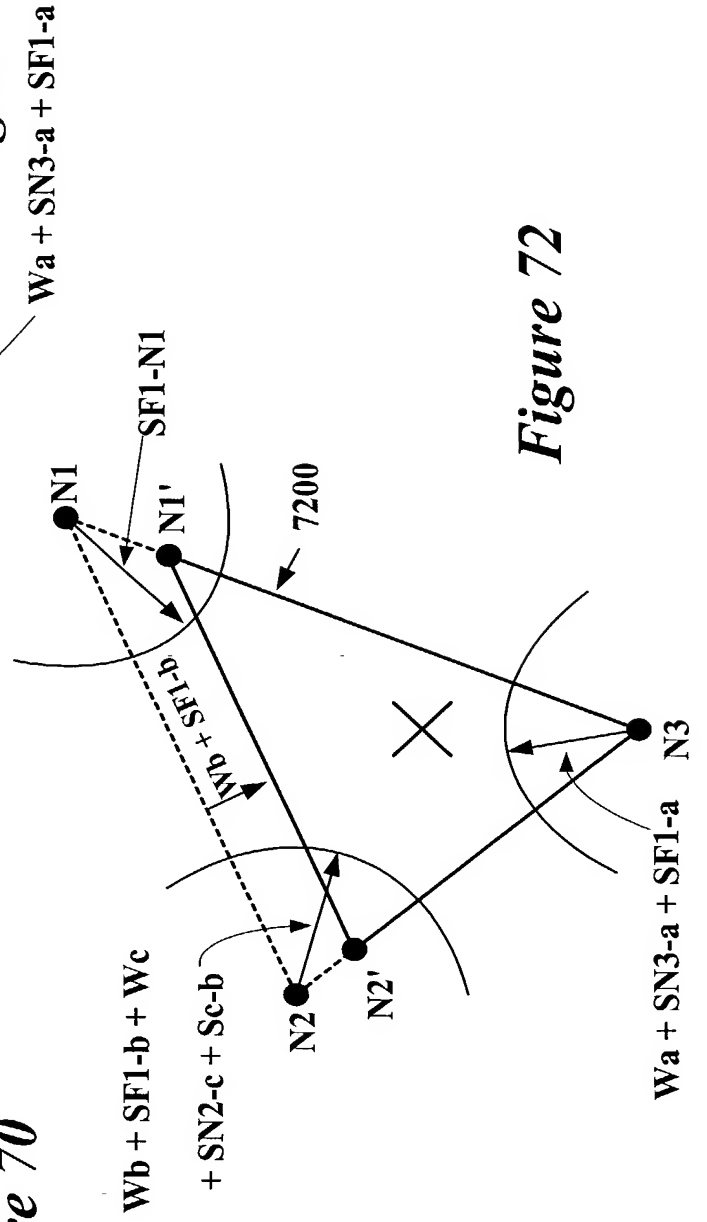
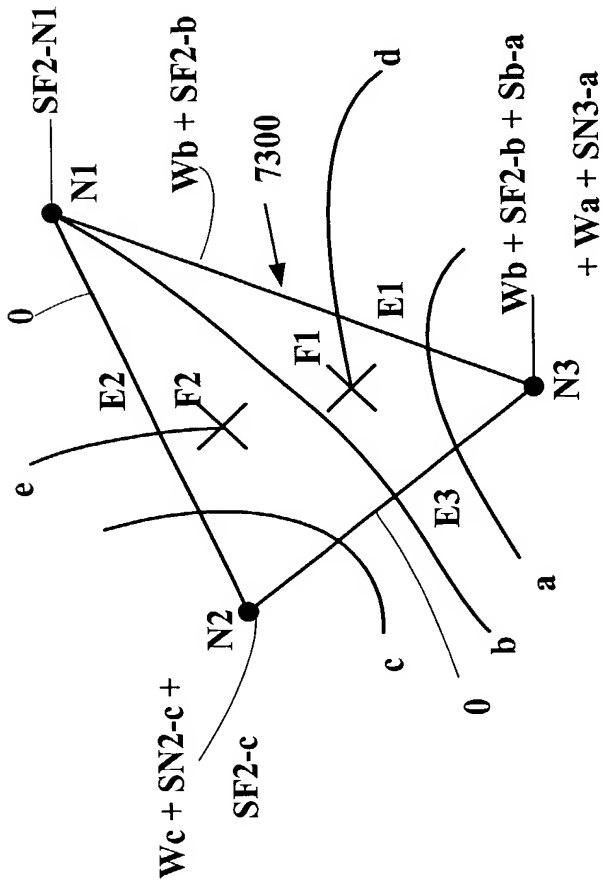
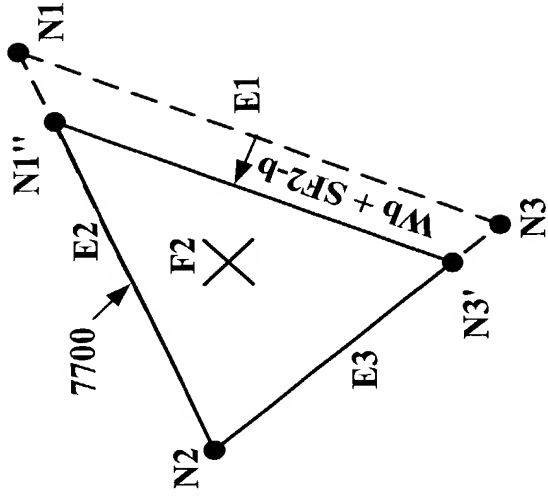


Figure 71

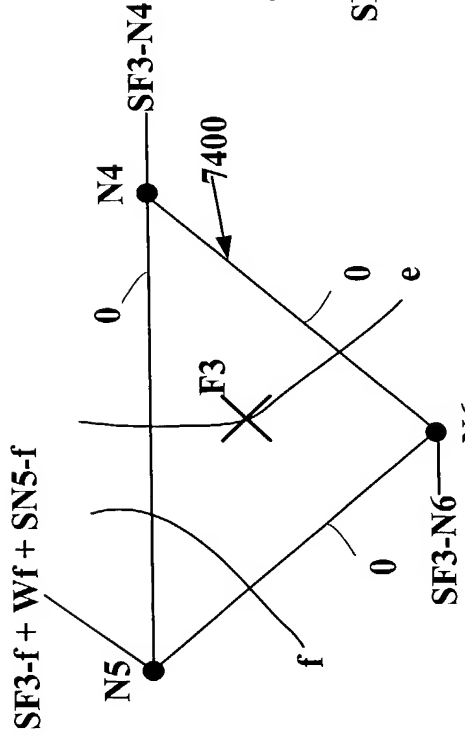
Figure 72



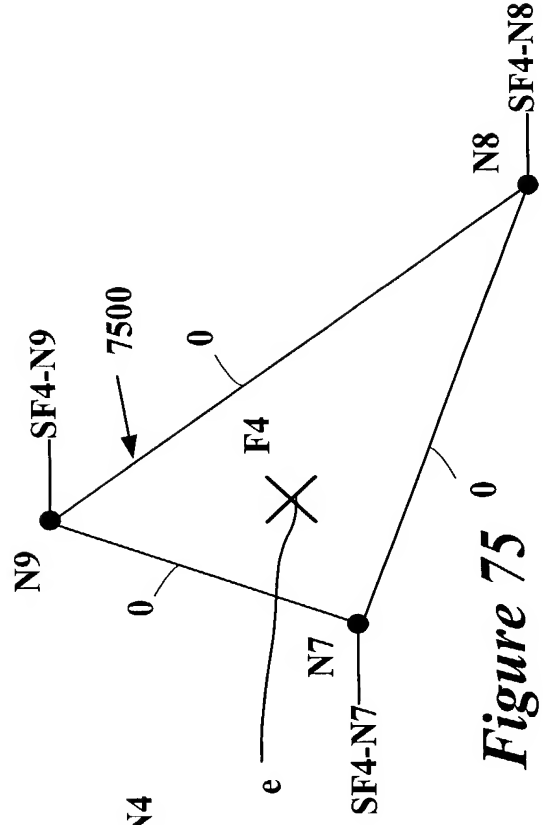
**Figure 73**



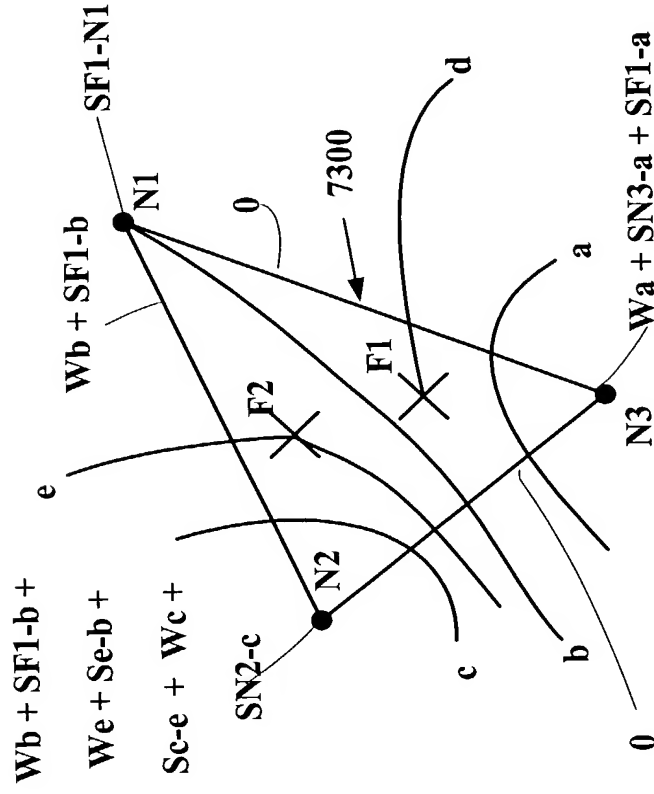
**Figure 77**



## Figure 74

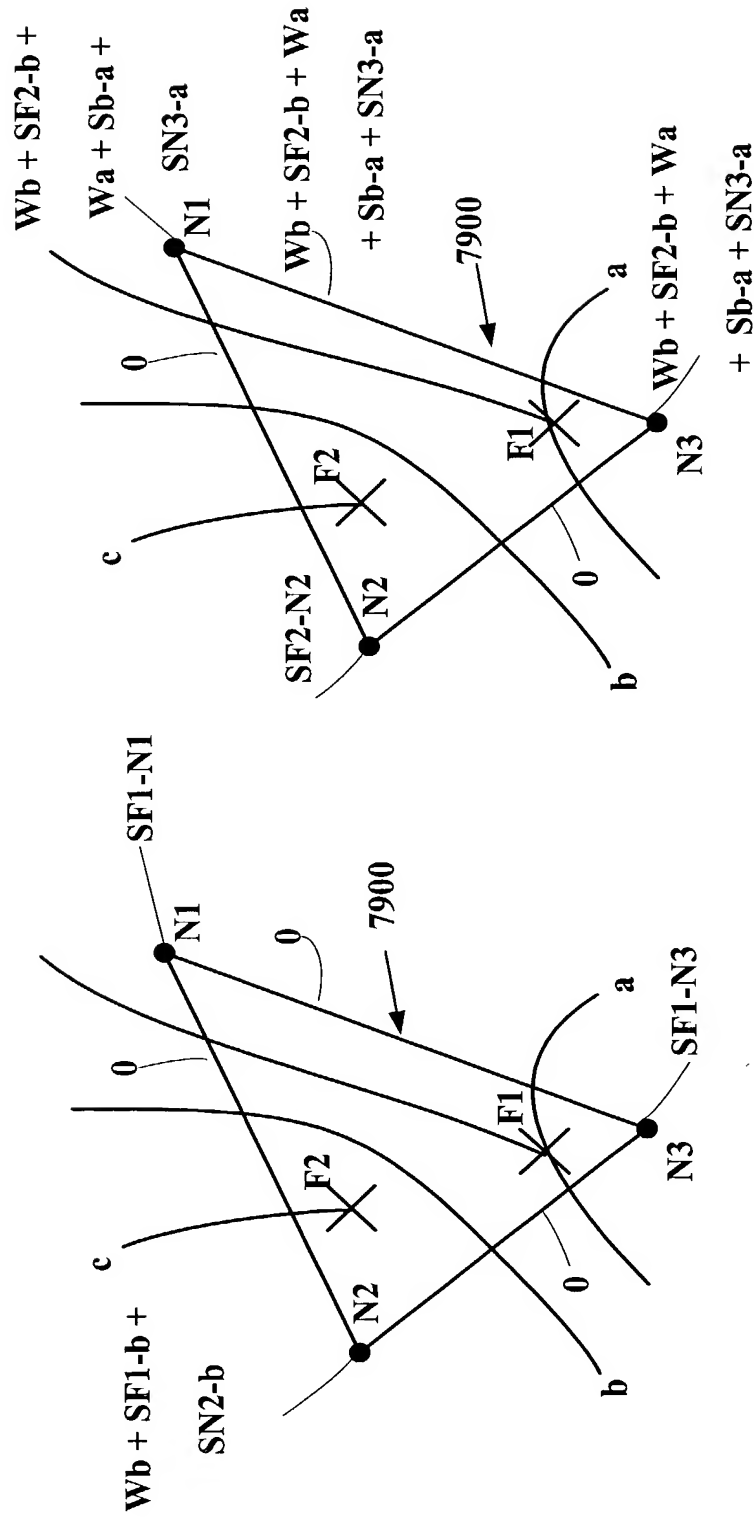


## Figure 75

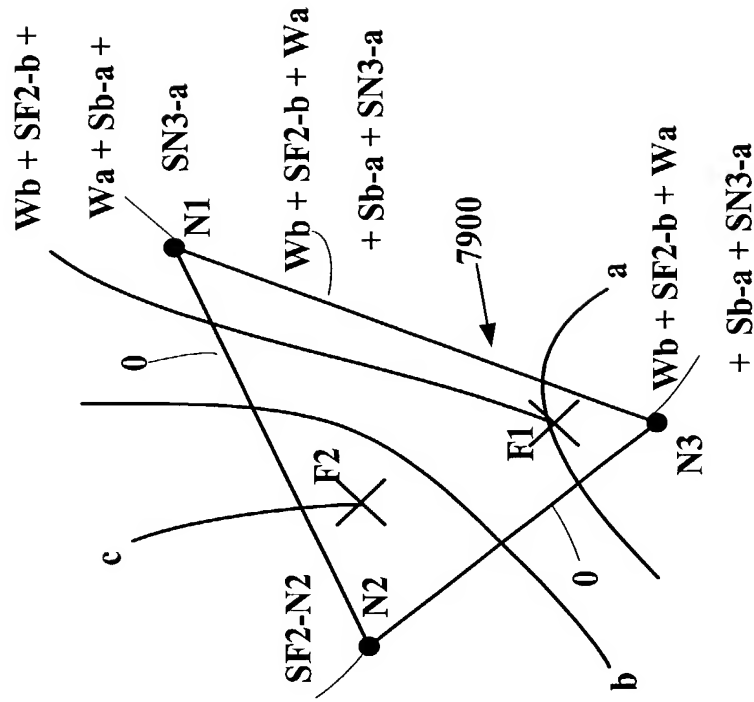


**Figure 76**





**Figure 79**



**Figure 80**

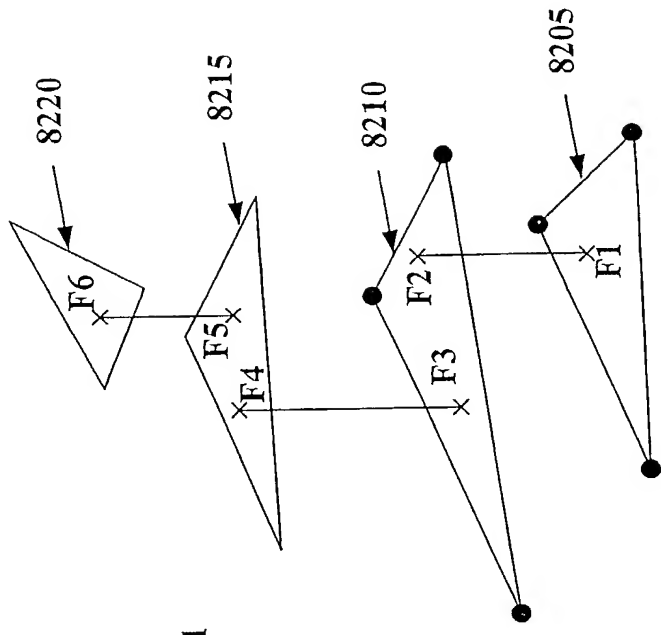
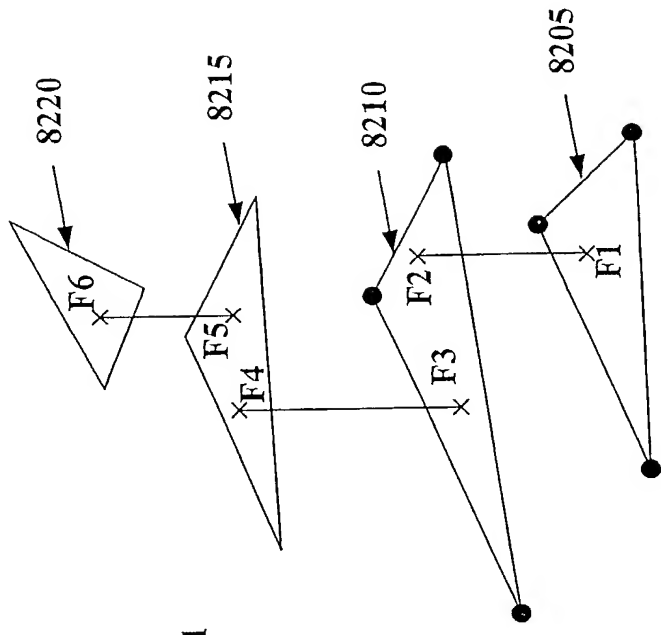


Figure 81

Figure 82



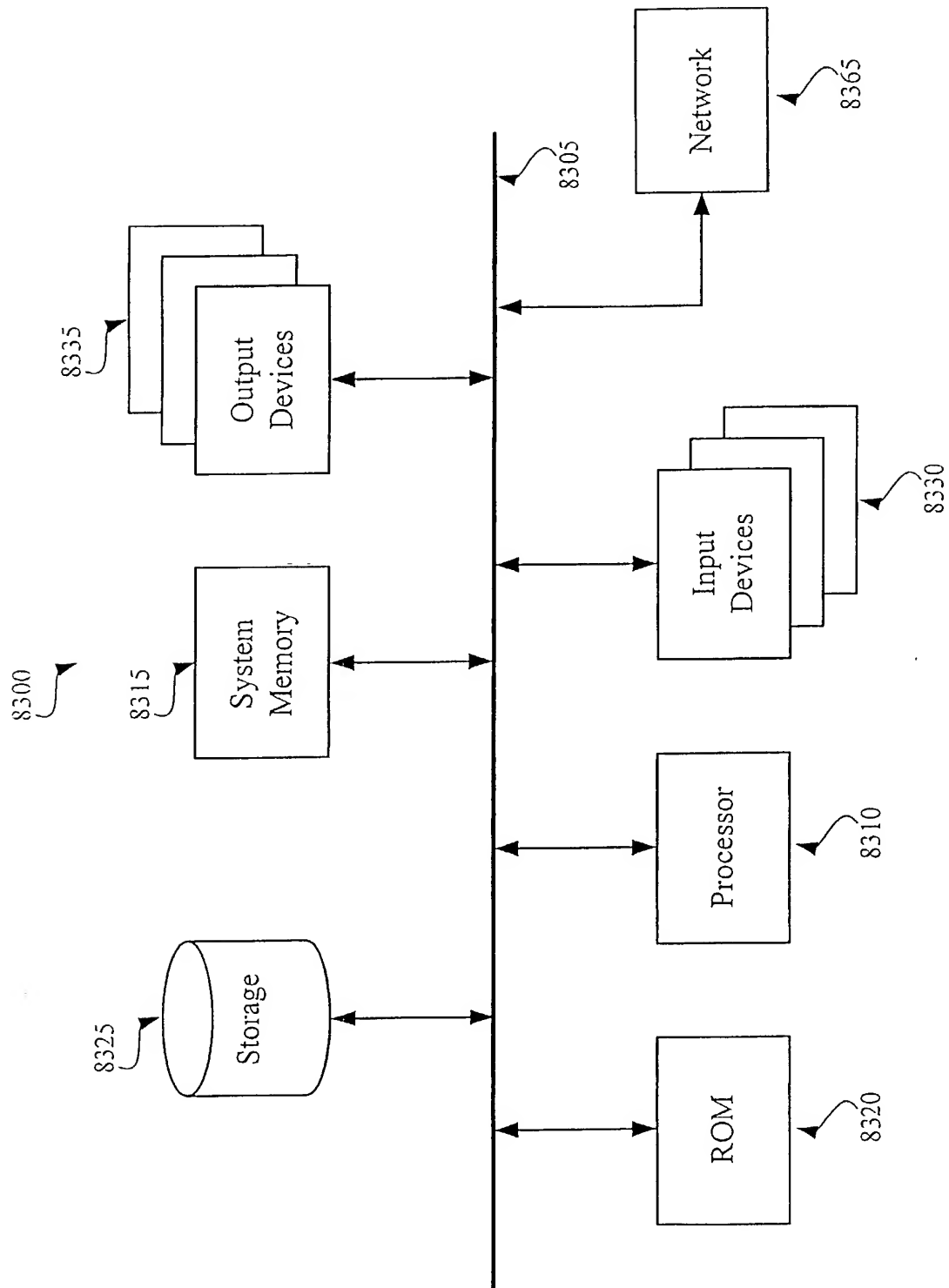


Figure 83